REPORT DOCUMENTATION PAGE

Form Approved OMB NO. 0704-0188

1. REPORT DATE (DD-MM-YYYY)	2. REPORT TYPE	3. DATES COVERED (From - To)
04-12-2017	Final Report	1-Jun-2016 - 30-Nov-2016

4. TITLE AND SUBTITLE
Final Report: Japan-United States Symposium: Polymer Synthesis for a Sustainable Future

5a. CONTRACT NUMBER
W911NF-16-1-0350

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER
611102

6. AUTHORS

5d. PROJECT NUMBER

5e. TASK NUMBER

5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAMES AND ADDRESSES
University of California - Los Angeles
Office of Contract and Grant Administration
11000 Kinross Avenue, Suite 211
Los Angeles, CA 90095 -1406

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS (ES)
U.S. Army Research Office
P.O. Box 12211
Research Triangle Park, NC 27709-2211

10. SPONSOR/MONITOR'S ACRONYM(S)
ARO

11. SPONSOR/MONITOR'S REPORT NUMBER(S)
69205-CH-CF.3

12. DISTRIBUTION AVAILIBILITY STATEMENT
Approved for public release; distribution is unlimited.

13. SUPPLEMENTARY NOTES
The views, opinions and/or findings contained in this report are those of the author(s) and should not contrued as an official Department of the Army position, policy or decision, unless so designated by other documentation.

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	15. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			Heather Maynard
UU	UU	UU	UU		19b. TELEPHONE NUMBER 310-267-5162

RPPR Final Report
as of 11-Jun-2018

Agency Code:

Proposal Number: 69205CHCF **Agreement Number: W911NF-16-1-0350**
INVESTIGATOR(S):

Name: PhD Heather D. Maynard
Email: maynard@chem.ucla.edu
Phone Number: 3102675162
Principal: Y

Organization: **University of California - Los Angeles**
Address: Office of Contract and Grant Administration, Los Angeles, CA 900951406
Country: USA
DUNS Number: 092530369 EIN: 956006143
Report Date: 28-Feb-2017 Date Received: 04-Dec-2017
Final Report for Period Beginning 01-Jun-2016 and Ending 30-Nov-2016
Title: Japan-United States Symposium: Polymer Synthesis for a Sustainable Future
Begin Performance Period: 01-Jun-2016 **End Performance Period:** 30-Nov-2016
Report Term: 0-Other
Submitted By: PhD Heather Maynard Email: maynard@chem.ucla.edu
Phone: (310) 267-5162
Distribution Statement: 1-Approved for public release; distribution is unlimited.

STEM Degrees: **STEM Participants:** 8

Major Goals: The major goals of the project are as follows: The overarching theme of the meeting is Polymer Synthesis for a Sustainable Future. There is an immediate and constantly growing need for research related to understanding polymer chemistry from molecules to nano and macroscopic scale assembly in relation to chemical and chain architectural parameters. New synthetic methods that precisely control the functionality, molecular weight, and assembly of polymers will be discussed. Applications in sensing, responsive polymers, energy, enzyme stabilization and other topics important to the US Military and society as a whole will be covered. This meeting will cover new and exciting research that is at the cutting edge of polymer science and will be a foreground to discuss the latest exciting results in polymer chemistry to move the field forward. It is certain to foster rigorous discussion and initiate collaboration between researchers working in these fields.

An additional objective of this symposium is to bring leaders in the field from both the United States and Japan to discuss research from structure and synthesis to application. The limited amount of speakers from each side and the remote setting will ensure rigorous discussion and provide a real advantage to all the participants enabling maximal exchange of ideas. Thus, the forum is also expected to facilitate new, international collaborations among polymer scientists in and between the US and Japan. The complementarity of the different research will ensure helpful discussion and likely lead to collaboration between the two countries with long-term interactions sparking innovation and constructive interaction. In addition, younger faculty from both countries will speak, in addition to established researchers in the field. This is expected to facilitate strong connections and mentorship with long-lasting positive outcomes for the younger faculty's careers and provide these younger professors with an invaluable opportunity for connection and interaction with important researchers in the field.

To summarize, the major goals of the meeting are as follows: (a) The meeting is important to further research in polymer chemistry by enabling rigorous discussion on structure-property relationships and applications important to the US Army and society as a whole. (b) Half the speakers are from the US and half are from Japan providing invaluable connections for US participants with speakers from a different country and culture, allowing for the establishment of important collaborations in and between countries. (c) Younger scientists will be in a remote setting for days with senior scientists important to their careers allowing maximal scientific interactions and establishment of strong mentorship ties.

Accomplishments: The Japan-United States Symposium on Polymer Synthesis for a Sustainable Future brought together thirty-five speakers from both the United States and Japan to collaborate and advance working knowledge of polymer research. Many more people attended from academia, industry and the United States government and the United States department of defense. The meeting brought together renown scientists from the US and Japan

and covered new and exciting research at the cutting edge of polymer science, and the latest exciting results in polymer chemistry were discussed that move the field forward to move directions of importance to the US society. Experts from the field of polymer science and research presented their current research and findings, and the discussion leaders facilitated open dialogue to advance the scientific impact of polymer synthesis and its ability to provide a more sustainable future. The overarching theme of the meeting was the synthesis of polymers for a sustainable future. There is an immediate and constantly growing need for research related to understanding polymer chemistry (plastics) from molecules to nano and macroscopic scale assembly in relation to chemical and structural parameters. New synthetic methods that precisely control the functionality, molecular weight, and assembly of polymers were discussed. Applications in sensing, responsive polymers, energy, enzyme stabilization and other topics important to the United States Army and society as a whole were covered. The meeting was held in a remote location in Hokkaido, Japan and the venue was very suitable to concentrate on the scientific pursuit of the meeting. Further, the remote location facilitated interactions between scientists of both countries and allowed for maximal exchange and input. The symposium fostered rigorous discussion and served as a forum to initiate collaboration between researchers working in these fields. The international nature of the event allowed for scientists from both countries to share knowledge and further the field as a whole. Each scientist presented a thirty minute talk on their specific research and the US and Japanese speakers alternated throughout the symposium. Each morning and afternoon presentation session were scheduled with breaks and free time to ask specific questions of each presenter, and time to have a dialogue about each person's specific expertise. In addition, younger faculty from both countries spoke. Thus, the meeting provided an invaluable opportunity for new faculty to make connections and interact with senior researchers in the field. This facilitated strong connections and initiated mentorship with these younger scientists that will be sure to help their careers for many years to come. The uploaded attachment has detailed information on the meeting venue, the conference schedule, the participant list and the CVs and abstracts of all the speakers.

To summarize, the Japan-United States Symposium on Polymer Synthesis for a Sustainable Future reached the following exciting objectives. (a) The meeting enabled rigorous discussion on structure-property relationships and applications important to the US Army and society as a whole. (b) Half the speakers were from the US and half were from Japan providing invaluable connections for US participants with speakers from a different country and culture, allowing for the establishment of important collaborations in and between countries. (c) It was a great venue to facilitate strong connections between new and established faculty and mentorship with long-lasting positive outcomes for the younger faculty’s careers.

Training Opportunities: This symposium helped train younger scientists, particularly females and under represented minorities, by providing an excellent forum for education, maximal scientific interaction, and professional development. In particular, 11 assistant and associate professors spoke. In addition, 8 graduate students attended. These younger scientists had a unique chance to come together with world leaders in the field. The limited number of participants from each side and the remote setting ensured rigorous discussion and provided a real advantage to younger faculty with regard to interaction with senior researchers in the field. This in turn facilitated strong connections and mentorship with very likely long lasting positive outcomes for the younger faculty’ s careers. In addition, there were 20 representatives of industry at the conference to help all the attendees understand problems important to industry, and 2 representatives from the DOD thereby providing important information on opportunities for polymer research important to the military. The representatives from AOARD/AFOSR and USAITC also provided helpful summaries to the Japanese scientists regarding initiatives and funding opportunities from their offices that could in turn help their careers. In addition, the symposium had equal numbers of speakers from the US and Japan providing invaluable connections for all participants with speakers from a different country and culture, allowing for the establishment and continuation of important collaborations to drive the field forward to maximally benefit society.

RPPR Final Report
as of 11-Jun-2018

Results Dissemination: The materials that were produced as an outcome of this conference included a detailed program with the names and CVs of chairs and attendees, the names and affiliations of all speakers, the title of each science session, and the full title of each speaker's talk. An important part of the program was extensive scientific abstracts with figures and references. This material was provided at the conference and is also uploaded as an attachment.

Speakers conveyed both published and unpublished work and cutting edge information to their colleagues; these disclosures stimulated expansive discussion to advance the field. The inclusive atmosphere populated by speakers with complimentary expertise enabled cultivation of innovative basic science approaches to address the most important challenges facing our world. The speakers who are leaders in the field of polymer science from both United States and Japan facilitated rigorous discussion and budding of cutting edge ideas for new synthesis methods, new materials, new characterization and new directions in the field. It is expected that private disclosure brought up either individually or collectively by the attendees has been or soon will be published and communicated to the general community of science by the attendees themselves.

Honors and Awards: Maynard received the following honors and awards during the reporting period:

Member of the Defense Science Study Group

Plenary Speaker, IUPAC Conference on Physical Organic Chemistry (ICPOC23), Sydney, Australia, "Rationally Designed Biomimetic Polymers for Protein Stabilization and Delivery," July 5, 2016.

Plenary Speaker, Next Generation Macromolecular Therapeutics Conference, Melbourne, Australia, "Biomimetic Polymers that Enhance the Activity of Proteins in Angiogenesis and Wound Healing," November 18, 2016.

Plenary Speaker, Australian Polymer Society Meeting, Lourne, Australia, "Biomimetic Polymers for Protein Stabilization: From Design to Synthesis to Application in Food and Medicine," November 21, 2016.

Protocol Activity Status:

Technology Transfer: Nothing to Report

PARTICIPANTS:

Participant Type: PD/PI
Participant: Heather Dawn Maynard
Person Months Worked: 1.00
Project Contribution:
International Collaboration:
International Travel:
National Academy Member: N
Other Collaborators:

Funding Support:

2016 Japan-USA Seminar on Polymer Synthesis:

-Polymer Synthesis for a Sustainable Future-

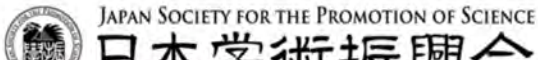
June 24 (Fri) – June 28 (Tue), 2016

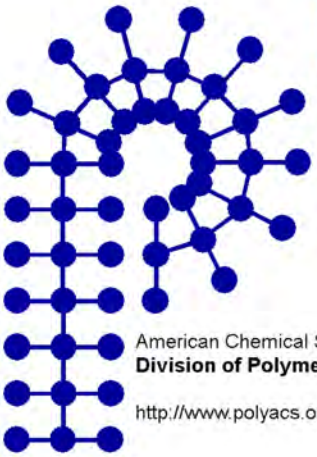
Hilton Niseko Village, Hokkaido, Japan

2016 Japan-USA Seminar on Polymer Synthesis:

-Polymer Synthesis for a Sustainable Future-

Thanks to the Following Companies and Agencies
for Their Generous Support of This Symposium

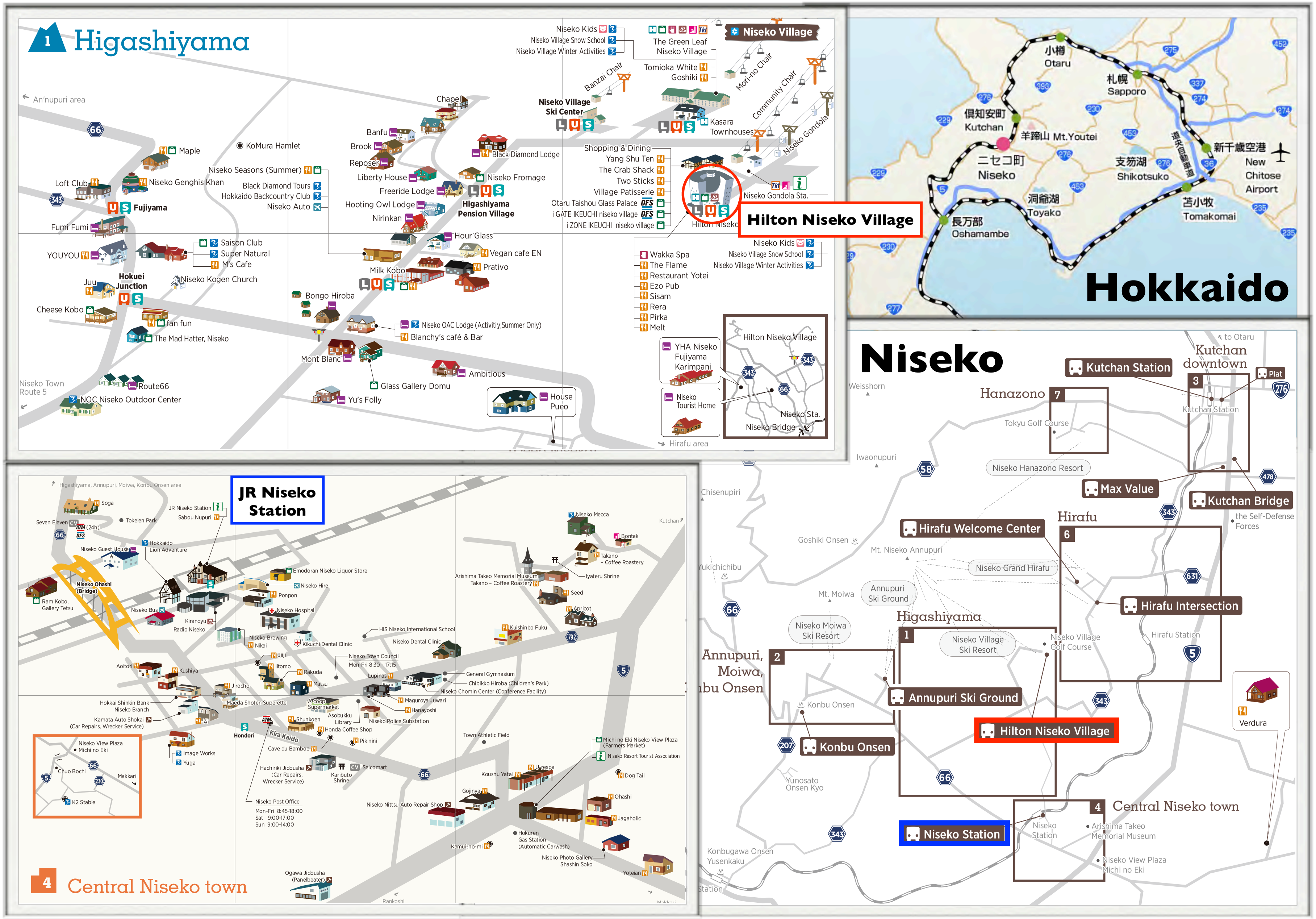




American Chemical Society
Division of Polymer Chemistry

http://www.polyacs.org


2016 Japan-USA Seminar on Polymer Synthesis, Hilton Niseko Village, Hokkaido, Japan
Friday June 24
Saturday June 25
Sunday June 26
Monday June 27
Tuesday June 28
8:30
9:00
9:30
10:00
10:30
11:00
11:30
12:00
12:30
13:00
13:30
14:00
14:30
15:00
15:30
16:00
16:30
17:00
17:30
18:00
18:30
20:30
Registration
Welcome Reception
Opening Remarks
L1 Matyjaszewski
L2 Kamigaito
L3 Pentzer
Break
L4 Ouchi
L5 Hawker
L6 Suginome
IP-1 Asahi Techneion
IP-2 TORAY
Lunch and Free Time
L7 Waymouth
L8 Nozaki
L9 Coates
Break
L10 Nakano
L11 Luscombe
L12 Kimura
Dinner and Free Time
L13 Percec
L14 Aida
L15 Sumerlin
Break
L16 Takeuchi
L17 RH Grubbs
L18 T Satoh
IP-3 DAICEL
IP-4 ZEON
Photo Shoot, Lunch, and Free Time
L19 RB Grubbs
L20 Sekitani
L21 Campos
Break
L22 Kato
L23 Wooley
L24 Kimizuka
IP-5 Mitsui Chemicals
IP-6 Sumitomo Chemical
Dinner and Free Time
L25 Hillmyer
L26 Tanaka
L27 Johnson
Break
L28 Ishida
L29 Swager
L30 Itami
IP-7 KANEKA
IP-8 US Army
Lunch and Excursion
Free Time
Banquet
L31 E Sato
L32 Fors
L33 Hamachi
Break
L34 Herrera-Alonso
L35 Sawamoto
Closing Remarks
Adjourn



Higashiyama
An'nupuri area
KoMura Hamlet
Maple
Niseko Seasons (Summer)
Loft Club
Niseko Genghis Khan
Black Diamond Tours
Hokkaido Backcountry Club
Niseko Auto
Fujiyama
Fumi Fumi
Saison Club
Super Natural
M's Cafe
YOUYOU
Hokuei Junction
Niseko Kogen Church
Juu
Cheese Kobo
fan fun
The Mad Hatter, Niseko
Niseko Town Route 5
Route66
NOC Niseko Outdoor Center
Chapel
Banfu
Brook
Reposer
Black Diamond Lodge
Liberty House
Niseko Fromage
Freeride Lodge
Hooting Owl Lodge
Higashiyama Pension Village
Nirinkan
Hour Glass
Vegan cafe EN
Milk Kobo
Prativo
Bongo Hiroba
Niseko OAC Lodge (Activity,Summer Only)
Blanchy's café & Bar
Mont Blanc
Ambitious
Glass Gallery Domu
Yu's Folly
House Pueo
Niseko Kids
Niseko Village Snow School
Niseko Village Winter Activities
The Green Leaf
Niseko Village
Tomioka White
Goshiki
Banzai Chair
Mori-no Chair
Community Chair
Niseko Gondola
Niseko Village Ski Center
Kasara Townhouses
Shopping & Dining
Yang Shu Ten
The Crab Shack
Two Sticks
Village Patisserie
Otaru Taishou Glass Palace
i GATE IKEUCHI niseko village
i ZONE IKEUCHI niseko village
Niseko Gondola Sta.
Hilton Niseko
Hilton Niseko Village
Wakka Spa
The Flame
Restaurant Yotei
Ezo Pub
Sisam
Rera
Pirka
Melt
YHA Niseko Fujiyama Karimpani
Niseko Tourist Home
Niseko Sta.
Niseko Bridge
Hirafu area
小樽 Otaru
札幌 Sapporo
倶知安町 Kutchan
羊蹄山 Mt.Youtei
ニセコ町 Niseko
支笏湖 Shikotsuko
新千歳空港 New Chitose Airport
洞爺湖 Toyako
長万部 Oshamambe
苫小牧 Tomakomai
Hokkaido
Niseko
Kutchan Station
Kutchan downtown
to Otaru
Plat
Hanazono
Tokyu Golf Course
Kutchan Station
Weisshorn
Iwaonupuri
Niseko Hanazono Resort
Max Value
Kutchan Bridge
the Self-Defense Forces
Chisenupuri
Hirafu
Hirafu Welcome Center
Goshiki Onsen
Mt. Niseko Annupuri
Niseko Grand Hirafu
Yukichichibu
Annupuri Ski Ground
Mt. Moiwa
Hirafu Intersection
Higashiyama
Niseko Moiwa Ski Resort
Niseko Village Ski Resort
Niseko Village Golf Course
Hirafu Station
Annupuri, Moiwa, Konbu Onsen
Konbu Onsen
Annupuri Ski Ground
Hilton Niseko Village
Konbu Onsen
Verdura
Yunosato Onsen Kyo
Central Niseko town
Niseko Station
Arishima Takeo Memorial Museum
Konbugawa Onsen Yusenkaku
Niseko View Plaza Michi no Eki
JR Niseko Station
Higashiyama, Annupuri, Moiwa, Konbu Onsen area
Soga
JR Niseko Station
Sabou Nupuri
Seven Eleven
ATM (24h)
Tokeien Park
Niseko Guest House
Hokkaido Lion Adventure
Niseko Ohashi (Bridge)
Ram Kobo, Gallery Tetsu
Niseko Bus
Kiranoyu
Radio Niseko
Emodoran Niseko Liquor Store
Niseko Hire
Ponpon
Niseko Hospital
Niseko Brewing
Nikai
Kikuchi Dental Clinic
Niseko Mecca
Bontak
Takano - Coffee Roastery
Arishima Takeo Memorial Museum
Takano - Coffee Roastery
Iyateru Shrine
Seed
Apricot
Kuishinbo Fuku
HIS Niseko International School
Niseko Dental Clinic
Niseko Town Council
Mon-Fri 8:30 - 17:15
Lupinas
General Gymnasium
Chibikko Hiroba (Children's Park)
Niseko Chomin Center (Conference Facility)
Aoitori
Kushiya
Jiiji
Iitomo
Rakuda
Matsu
Jirocho
Maeda Shoten Superette
A-coop Supermarket
Asobukku Library
Maguroya Juwari
Hanayoshi
Niseko Police Substation
Hokkai Shinkin Bank Niseko Branch
Kamata Auto Shokai (Car Repairs, Wrecker Service)
Hondori
Kira Kaido
Shunkoen
Honda Coffee Shop
Pikinini
Cave du Bamboo
Image Works
Yuga
Niseko View Plaza
Michi no Eki
Chuo Bochi
Makkari
K2 Stable
Hachiriki Jidousha (Car Repairs, Wrecker Service)
Kaributo Shrine
Seicomart
Niseko Post Office
Mon-Fri 8:45-18:00
Sat 9:00-17:00
Sun 9:00-14:00
Town Athletic Field
Michi no Eki Niseko View Plaza (Farmers Market)
Niseko Resort Tourist Association
Koushu Yatai
Uuespa
Dog Tail
Gojinya
Ohashi
Jagaholic
Niseko Nittsu Auto Repair Shop
Hokuren Gas Station (Automatic Carwash)
Kamui-no-mi
Niseko Photo Gallery Shashin Soko
Yoteian
Ogawa Jidousha (Panelbeater)
Rankoshi
Kutchan
Makkari
Central Niseko town

Hilton Niseko Village
– Floor Plan 3F –

Banquet (ANNUPURI)

Welcome Reception (HIGASHIYAMA)

YOTEI Restaurant

Seminar Hall (HOKKAIDO)

SHOPPING AND DINING AREA IN THE NISEKO VILLAGE

RESTAURANT & CAFE AT THE NISEKO VILLAGE

① TWO STICKS (トゥスティックス)

Opening Hours
11:30–21:00
Last Call: 20:30

A hip Asiatic tapas and bar inspired by cutting edge bars but with a rustic Hokkaido twist – socialise, eat, drink and party with DJs and musicians, funky cocktails and local brews. Enter the intimate space as a stranger and end the night getting to know new friends.

② YANG SHU TEN (やん衆天)

Opening Hours
Lunch: 11:30–15:00
Dinner: 17:00–21:00

Fresh Hokkaido produce and the oceans' bounty are turned into sushi, tempura and teppanyaki dishes including delightful local dairy desserts.

③ THE CRAB SHACK (ザ・クラブシャック)

Opening Hours
Dinner: 17:30–20:30

Pick from a seafood marketplace display that changes daily and seasonally. The aromas and cooking methods, be it steamed *kaizoku-yaki* style, *konro* grilled style or your preferred style, provide the theatrics against the rustic fishing memorabilia and paraphernalia décor that imitate a Hokkaido boathouse feel.

① TWO STICKS

本格タイ・マレーシア・シンガポール料理
トゥスティックス
11:30am～9:30pm
〈ラストオーダー〉9:00pm
T 0136-44-1152

●夏のお勧めメニュー
こだわりのチキンカレー
1,100円 要予約

●ワンドリンクとオードブルセット
パーティープラン
1,000円 要予約

② 焼鳥天 やん衆天

〈ご昼食〉11:30am～3:00pm
〈ご夕食〉5:00pm～10:00pm
〈ラストオーダー〉9:30pm
T 0136-44-1160

●おでん、串焼き、串カツ、6,000円の食べ・飲み放題（しゃぶしゃぶ、またはすき焼き）
●ご家族割引きとして、11歳までのお子様と、65歳以上のお年寄りの方々には、
食べ・飲み放題を半額でご提供。

③ the Crab shack

レストラン
ザ・クラブシャック
〈ご夕食〉5:30pm～9:00pm
〈ラストオーダー〉8:30pm
7/17～8/23は期間限定屋台ランチメニュー登場!
T 0136-44-1153

●夏のおすすめディナーメニュー
ジンギスカン食べ飲み放題 90分!
お一人様 4,800円

●ワンドリンクとジンギスカンのセット
パーティープラン!!
お一人様 2,800円

※料金はすべて税込です。

④ VILLAGE PATISSERIE (ビレッジパティスリー)

Opening Hours
8:00–17:00

Reminiscent of a floral garden with a harmony of colours and seasonal flavours, the Village Patisserie offers a vibrant array of pastries, chocolates and Japanese cakes. The scrumptious creations are perfect over gourmet coffee, tea or beverages for a delightful respite from mountain adventures.

▼切り取ってビレッジパティスリーの係員にお渡しください。

Coupon ④

スイーツ&カフェ
ビレッジパティスリー
8:00am～5:00pm〈ラストオーダー〉4:30pm
T 0136-44-1178
●朝食セット（通常：1,380円）
1,230円
●朝食セット 150円OFF!

※本券と他割引券との併用はできません。※8月8日～16日の期間は使用できません。

Coupon ④

スイーツ&カフェ
ビレッジパティスリー
8:00am～5:00pm〈ラストオーダー〉4:30pm
T 0136-44-1178
●ワッフル or パンケーキセット
（通常：1,180円）
1,030円
●ワッフル or パンケーキセット 150円OFF!

※本券と他割引券との併用はできません。※8月8日～16日の期間は使用できません。

Excursion around Niseko

Niseko-Kyogoku Fukidashi Park
http://www.town-kyogoku.jp/kanko-event/fukidashi-park/

Hangetsu Lakeside Nature Park
http://www.town.kutchan.hokkaido.jp/tourism/midokoro/hangetsuko/

Niseko Milk-Kobo
http://www.milk-kobo.com/

2016 Japan-USA Seminar on Polymer Synthesis:

-Polymer Synthesis for a Sustainable Future-

PARTICIPANTS

Japan

Organizer

Eiji Yashima (Nagoya U.)

Invited Speakers

Takuzo Aida (U. Tokyo)
Itaru Hamachi (Kyoto U.)
Yasuhiro Ishida (RIKEN)
Ken-ichiro Itami (Nagoya U.)
Masami Kamigaito (Nagoya U.)
Takashi Kato (U. Tokyo)
Nobuo Kimizuka (Kyushu U.)
Shunsaku Kimura (Kyoto U.)
Tamaki Nakano (Hokkaido U.)
Kyoko Nozaki (U. Tokyo)
Makoto Ouchi (Kyoto U.)
Eriko Sato (Osaka City U.)
Toshifumi Satoh (Hokkaido U.)
Tsuyoshi Sekitani (Osaka U.)
Michinori Suginome (Kyoto U.)
Daisuke Takeuchi (Tokyo Inst. Tech.)
Keiji Tanaka (Kyushu U.)

Special Lecturer

Mitsuo Sawamoto (Kyoto U.)

U. S. A.

Organizer

Heather D. Maynard (U. California Los Angeles)

Invited Speakers

Luis Campos (Columbia U.)
Geoffrey W. Coates (Cornell U.)
Brett P. Fors (Cornell U.)
Robert B. Grubbs (Stony Brook U.)
Robert H. Grubbs (California Inst. Tech.)
Craig J. Hawker (U. California Santa Barbara)
Margarita Herrera-Alonso (Johns Hopkins U.)
Mark Hillmyer (U. Minnesota)
Jeremiah Johnson (Massachusetts Inst. Tech.)
Christine Luscombe (U. Washington)
Krzysztof Matyjaszewski (Carnegie Mellon U.)
Emily Pentzer (Case Western Reserve U.)
Virgil Percec (U. Pennsylvania)
Brent Sumerlin (U. Florida)
Timothy M. Swager (Massachusetts Inst. Tech.)
Robert Waymouth (Stanford U.)
Karen L. Wooley (Texas A&M U.)

OBSERVERS

Yoshio Okamoto (Nagoya U.)
Hideto Ito (Nagoya U.)
Kenneth Caster (AOARD/AFOSR)
Christopher Drew (USAITC)

INDUSTRIAL OBSERVERS (U. S. A.)

Bruce Hahn (Goodyear)
Yong Zhang (MilliporeSigma)

INDUSTRIAL OBSERVERS (Japan)

Yuki Gohara (Asahi Techneion)
Kiyoharu Tsutsumi (DAICEL)
Kumpei Kobayashi (JSR)
Koji Endo (Mitsui Chemicals)
Kazuo Takaoki (Sumitomo Chemical)
Tomoya Oohata (TEIJIN)
Yumiko Ito (TORAY)
Daisuke Yamamoto (TORAY)
Shigetaka Hayano (ZEON)
Tommy Uchida (Asahi Techneion)
Hajime Inami (JSR)
Yoshiki Nakagawa (KANEKA)
Tomoaki Matsugi (Mitsui Chemicals)
Hidekazu Yamada (Sumitomo Chemical)
Shinichiro Shoji (TEIJIN)
Daisuke Izuhara (TORAY)
Koji Yamauchi (TORAY)
Youhei Tateishi (ZEON)

GRADUATE STUDENTS

Ryoma Ishidate (Nagoya U.)
Shinya Yamamoto (Nagoya U.)
Rina Mogaki (U. Tokyo)
Seunghyun Sim (U. Tokyo)
Junki Tanabe (Nagoya U.)
Hubiao Huang (U. Tokyo)
Koki Sano (U. Tokyo)
Keiichi Yano (U. Tokyo)

SEMINAR STAFF

Naoki Ousaka (Nagoya U.)
Kyoko Kusakabe (Nagoya U.)
Daisuke Taura (Nagoya U.)

PROGRAM

2016 Japan-USA Seminar on Polymer Synthesis:

-Polymer Synthesis for a Sustainable Future-

SCIENTIFIC PROGRAM

Friday, June 24

17:00 - 18:00 **Registration (3F, Hokkaido)**

18:00 - 20:00 **Welcome Reception (3F, Higashiyama)**

Saturday, June 25 (3F, Hokkaido)

8:20 - 8:30 **Opening Remarks**
Eiji Yashima (Nagoya University, Japan)

8:30 - 9:00 **Krzysztof Matyjaszewski** (Carnegie Mellon University, USA)
"Nanostructured Functional Materials by Atom Transfer Radical Polymerization"

9:00 - 9:30 **Masami Kamigaito** (Nagoya University, Japan)
"Controlled Radical and Cationic Polymerization for Sustainability"

9:30 - 10:00 **Emily Pentzer** (Case Western Reserve University, USA)
"Polymerization of Silyl Ketenes"

10:00 - 10:30 **Break**

10:30 - 11:00 **Makoto Ouchi** (Kyoto University, Japan)
"Macromolecular Technology to Control Side-Chain Sequence
and Main-Chain Topology"

11:00 - 11:30 **Craig J. Hawker** (University of California Santa Barbara, USA)
"Accurate Control of Polymer Structure and Function"

11:30 - 12:00 **Michinori Suginome** (Kyoto University, Japan)
"Poly(quinoxaline-2,3-diyl): A Single-Handed Helical Polymer Platform
for Creating New Chiral Functions"

12:00 - 12:15 **Yuki Gohara** (Asahi Techneion Co., Ltd., Japan)

12:15 - 12:30 **Koji Yamauchi** (TORAY Industries, Inc., Japan)

12:30 - 14:00 **Lunch and Free Time**

14:00 - 14:30	**Robert Waymouth** (Stanford University, USA) "Catalysis as an Enabling Science for Monomer and Polymer Synthesis"
14:30 - 15:00	**Kyoko Nozaki** (The University of Tokyo, Japan) "New Aspects of Stereocontrolled Propylene Polymerization and Oligomerization"
15:00 - 15:30	**Geoffrey W. Coates** (Cornell University, USA) "Advances in Catalysis for Polymer Synthesis"
15:30 - 16:00	**Break**
16:00 - 16:30	**Tamaki Nakano** (Hokkaido University, Japan) "Chirality Induction to Polymers and Molecules Using Circularly Polarized Light"
16:30 - 17:00	**Christine Luscombe** (University of Washington, USA) "Controlled Synthesis of Polymers and Hybrid Materials for Optoelectronics Applications"
17:00 - 17:30	**Shunsaku Kimura** (Kyoto University, Japan) "Electron Mediating Properties of Nano-Architects with Peptide Scaffolds"
17:30 -	**Dinner and Free Time**

Sunday, June 26 (3F, Hokkaido)

8:30 - 9:00	**Virgil Percec** (University of Pennsylvania, USA) "Cell-Like Assemblies from Sequence-Defined Janus Glycodendrimers and Natural Cells"
9:00 - 9:30	**Takuzo Aida** (The University of Tokyo, Japan) "Rational Strategy for Chain-Growth Supramolecular Polymerization"
9:30 - 10:00	**Brent S. Sumerlin** (University of Florida, USA) "Synthesis and Investigation of Stimuli-Responsive Polymers Capable of Structurally Dynamic Assembly"
10:00 - 10:30	**Break**
10:30 - 11:00	**Daisuke Takeuchi** (Tokyo Institute of Technology, Japan) "Synthesis of New Polyolefins by Rational Design of Monomers and Catalysts"
11:00 - 11:30	**Robert H. Grubbs** (California Institute of Technology, USA) "Synthesis of Polymers Utilizing ROMP"
11:30 - 12:00	**Toshifumi Satoh** (Hokkaido University, Japan) "Organophosphate-Catalyzed Ring-Opening Polymerization"
12:00 - 12:15	**Kiyoharu Tsutsumi** (DAICEL Corporation, Japan)
12:15 - 12:30	**Shigetaka Hayano** (ZEON Corporation, Japan)
12:30 - 14:30	**Photo Shoot (3F, Hokkaido), Lunch, and Free Time**
14:30 - 15:00	**Robert B. Grubbs** (Stony Brook University, USA) "Building Responsive Materials from the Bottom up with Self-Assembling Block Copolymers"
15:00 - 15:30	**Tsuyoshi Sekitani** (Osaka University, Japan) "Large-Area, Ultraflexible, Organic Sensors for Cyber-Physical Systems"
15:30 - 16:00	**Luis M. Campos** (Columbia University, USA) "Designing Functional Materials from Unconventional Building Blocks"
16:00 - 16:30	**Break**

16:30 - 17:00 **Takashi Kato** (The University of Tokyo, Japan)
"Functional Liquid-Crystalline Assemblies for Energy and Environment"

17:00 - 17:30 **Karen L. Wooley** (Texas A&M University, USA)
"Advanced Applications for Sophisticated Nanoscopic Devices
(Realized by the Power of Chemistry, with Attention to Sustainability)"

17:30 - 18:00 **Nobuo Kimizuka** (Kyushu University, Japan)
"Photon Upconversion Based on Self-Assembled Molecular Systems"

18:00 - 18:15 **Tomoaki Matsugi** (Mitsui Chemicals, Inc., Japan)

18:15 - 18:30 **Kazuo Takaoki** (Sumitomo Chemical Co., Ltd., Japan)

18:30 - **Dinner and Free Time**

Monday, June 27 (3F, Hokkaido)

8:30 - 9:00	**Marc Hillmyer** (University of Minnesota, USA) "Bicontinuous Nanostructure Recipes using Block Polymers as Key Ingredients"
9:00 - 9:30	**Keiji Tanaka** (Kyushu University, Japan) "Structure and Dynamics of Polymer Chains at Solid Interfaces"
9:30 - 10:00	**Jeremiah A. Johnson** (Massachusetts Institute of Technology, USA) "Elasticity from a Molecular Perspective"
10:00 - 10:30	**Break**
10:30 - 11:00	**Yasuhiro Ishida** (RIKEN, Japan) "Single-Crystal-Like Soft Materials: Magnetic Orientation of Three-dimensional Polymer Networks"
11:00 - 11:30	**Timothy M. Swager** (Massachusetts Institute of Technology, USA) "Polymers with Iptycenes and Related Structures"
11:30 - 12:00	**Kenichiro Itami** (Nagoya University, Japan) "APEX: A New Way to Rapidly Synthesize Nanographenes and a New Form of Carbon"
12:00 - 12:15	**Yoshiki Nakagawa** (KANEKA Corporation, Japan)
12:15 - 12:30	**Kenneth C. Caster** (Asian Office of Aerospace Research and Development, USA) **Christopher Drew** (US Army International Technology Center, USA)
13:00 - 17:00	**Excursion** (Bus tour around Niseko with lunch box. Meet at the entrance at 12:45.)
18:30 - 20:30	**Banquet (3F, Annupuri)**

Tuesday, June 28 (3F, Hokkaido)

8:30 - 9:00	**Eriko Sato** (Osaka City University, Japan) "Design and Precise Synthesis of Reactive Polymers and Their Application to Functional Adhesive Materials"
9:00 - 9:30	**Brett P. Fors** (Cornell University, USA) "Shaping the Future of Polymer Molecular Weight Distributions"
9:30 - 10:00	**Itaru Hamachi** (Kyoto University, Japan) "Real Time Imaging of Orthogonally Self-Assembled Fibers"
10:00 - 10:30	**Break**
10:30 - 11:00	**Margarita Herrera-Alonso** (Johns Hopkins University, USA) "Functional Polycarbonates as Environmentally Responsive Materials"

Special Lecture

11:00 - 11:30	**Mitsuo Sawamoto** (Kyoto University, Japan) "From Cationic to Radical Living Polymerizations: "Back to the Future of Polymer Chemistry""
11:30 - 11:40	**Closing Remarks** **Heather D. Maynard** (University of California Los Angeles, USA) **Mitsuo Sawamoto** (Kyoto University, Japan)
11:40	**Adjourn**

DAY TWO

(Saturday, June 25)

CURRICULA VITAE AND ABSTRACTS

Curriculum Vitae

Name: **KRZYSZTOF MATYJASZEWSKI**

Date of Birth: April 8, 1950

Title: J.C. Warner University Professor of Natural Sciences

Affiliation: Carnegie Mellon University, Department of Chemistry

4400 Fifth Ave, Pittsburgh, PA 15213

Telephone, Fax, E-mail, Website: TEL. (412) 268-3209; fax (412) 268-6897, *km3b@andrew.cmu.edu*

http://www.cmu.edu/maty

Education: Polytechnic University of Lodz, Poland, Habilitation, 1985
Polish Academy of Sciences, Ph.D., 1976 (Prof. S. Penczek, Thesis Advisor)
Technical University of Moscow, B.S./M.S., 1972

Current Appointments:
Carnegie Mellon University, J.C. Warner University Professor of Natural Sciences (1998 - present)
Editor: "Progress in Polymer Science"

Recent Awards:
2015 The Dreyfus Prize in the Chemical Sciences
2015 Honorary Degree (*Doctorate Honoris Causa*) Technion, Haifa, Israel
2014 National Institute of Materials Science (Japan) Award
2013 Honorary Degree (*Doctorate Honoris Causa*) Universite P. & M. Curie, Sorbonne, Paris,
2013 Inaugural AkzoNobel North American Science Award (ACS)
2011 Hermann F. Mark Award (ACS)
2011 Wolf Prize in Chemistry, Israel

Research Interests: Synthesis of well defined macromolecules via living / controlled polymerizations. Catalysis. Co polymers and hybrids for optoelectronics and biomedicine.

Selected Representative Publications:
(1) Pan, X.; Fang, C.; Fantin, M.; Malhotra, N.; So, W. Y.; Peteanu, L. A.; Isse, A. A.; Gennaro, A.; Liu, P.; Matyjaszewski, K., Mechanism of Photoinduced Metal-Free Atom Transfer Radical Polymerization: Experimental and Computational Studies, *J. Am. Chem. Soc.* **2016**, *138*, 2411-2425.
(2) Cummings, C. S.; Murata, H.; Matyjaszewski, K.; Russell, A. J., Polymer-Based Protein Engineering Enables Molecular Dissolution of Chymotrypsin in Acetonitrile, *ACS Macro Lett.* **2016**, *5*, 493-497.
(3) Chatgilialoglu, C.; Ferreri, C.; Matyjaszewski, K., Radicals and Dormant Species in Biology and Polymer Chemistry, *ChemPlusChem* **2016**, *81*, 11-29.
(4) Daniel, W. F. M.; Burdynska, J.; Vatankhah-Varnoosfaderani, M.; Matyjaszewski, K.; Paturej, J.; Rubinstein, M.; Dobrynin, A. V.; Sheiko, S. S., Solvent-free, supersoft and superelastic bottlebrush melts and networks, *Nat. Mater.* **2016**, *15*, 183-189.
(5) Averick, S.; Mehl, R. A.; Das, S. R.; Matyjaszewski, K., Well-defined biohybrids using reversible-deactivation radical polymerization procedures, *J. Controlled Release* **2015**, *205*, 45-57.
(6) Matyjaszewski, K.; Tsarevsky, N. V., Macromolecular Engineering by Atom Transfer Radical Polymerization, *J. Am. Chem. Soc.* **2014**, *136*, 6513-6533.

Nanostructured Functional Materials by Atom Transfer Radical Polymerization

Krzysztof Matyjaszewski,
Carnegie Mellon University, Center for Macromolecular Engineering
Pittsburgh, PA, 15213, USA, matyjaszewski@cmu.edu

Many advanced nanostructured functional materials were designed and prepared by controlled/ living radical polymerization (CRP). More than 100 million tons of polymers are produced annually by conventional radical polymerization. However, macromolecular engineering is impossible in this process. Copper-based ATRP (atom transfer radical polymerization) catalytic systems with polydentate nitrogen ligands are among most efficient controlled/living radical polymerization systems. Recently, by applying new initiating/catalytic systems, Cu level in ATRP was reduced to a few ppm. Also metal-free ATRP was developed. ATRP of acrylates, methacrylates, styrenes, acrylamides, acrylonitrile and other vinyl monomers was employed for macromolecular engineering of polymers with precisely controlled molecular weights, low dispersities, designed shape, composition and functionality. Examples of well-defined copolymers, molecular brushes and various hybrid materials and bioconjugates prepared with high precision will be presented. These polymers are used as components of various advanced materials such as health and beauty products, coatings, elastomers, adhesives, surfactants, dispersants, lubricants, additives, or sealants. Special emphasis will be on nanostructured multifunctional hybrid materials for application related to environment, energy and catalysis.

(1) Pan, X.; Fang, C.; Fantin, M.; Malhotra, N.; So, W. Y.; Peteanu, L. A.; Isse, A. A.; Gennaro, A.; Liu, P.; Matyjaszewski, K. *J. Am. Chem. Soc.* **2016**, *138*, 2411-2425.
(2) Cummings, C. S.; Murata, H.; Matyjaszewski, K.; Russell, A. J. *ACS Macro Lett.* **2016**, *5*, 493-497.
(3) Chatgilialoglu, C.; Ferreri, C.; Matyjaszewski, K. *ChemPlusChem* **2016**, *81*, 11-29.
(4) Daniel, W. F. M.; Burdynska, J.; Vatankhah-Varnoosfaderani, M.; Matyjaszewski, K.; Paturej, J.; Rubinstein, M.; Dobrynin, A. V.; Sheiko, S. S. *Nat. Mater.* **2016**, *15*, 183-189.
(5) Yan, J.; Kristufek, T.; Schmitt, M.; Wang, Z.; Xie, G.; Dang, A.; Hui, C. M.; Pietrasik, J.; Bockstaller, M. R.; Matyjaszewski, K. *Macromolecules (Washington, DC, U. S.)* **2015**, *48*, 8208-8218.
(6) Fouz, M. F.; Mukumoto, K.; Averick, S.; Molinar, O.; McCartney, B. M.; Matyjaszewski, K.; Armitage, B. A.; Das, S. R. *ACS Cent. Sci.* **2015**, *1*, 431-438.
(7) He, H.; Averick, S.; Mandal, P.; Ding, H.; Li, S.; Gelb, J.; Kotwal, N.; Merkle, A.; Litster, S.; Matyjaszewski, K. *Advanced Science* **2015**, *2*, 1500069 (1500061-1500066).
(8) Pan, X.; Lamson, M.; Yan, J.; Matyjaszewski, K. *ACS Macro Letters* **2015**, *4*, 192-196.
(9) Williams, V. A.; Ribelli, T. G.; Chmielarz, P.; Park, S.; Matyjaszewski, K. *J. Am. Chem. Soc.* **2015**, *137*, 1428-1431.
(10) Averick, S.; Mehl, R. A.; Das, S. R.; Matyjaszewski, K. *J. Controlled Release* **2015**, *205*, 45-57.
(11) Dang, A.; Ojha, S.; Hui, C. M.; Mahoney, C.; Matyjaszewski, K.; Bockstaller, M. R. *Langmuir* **2014**, *30*, 14434-14442.
(12) Matyjaszewski, K.; Tsarevsky, N. V. *J. Am. Chem. Soc.* **2014**, *136*, 6513-6533.

Curriculum Vitae

Name: **MASAMI KAMIGAITO**

Date of Birth: September 28, 1965

Title: Professor

Affiliation: Nagoya University, Graduate School of Engineering,
Department of Applied Chemistry
Furo-cho, Chikusa-ku, Nagoya 464-8603 Japan

Telephone, Fax, E-mail, Website: TEL +81-52-789-5400, FAX +81-52-789-5112,
kamigait@apchem.nagoya-u.ac.jp
http://chiral.apchem.nagoya-u.ac.jp/~living/index.html

Education:

B.S.	Kyoto University, 1988
Ph.D.	Kyoto University, 1993
Postdoc	Kyoto University (Mitsuo Sawamoto), 1993 - 1995
Visiting Scholar	Stanford University (Robert M. Waymouth), 1997 - 1998

Current Appointments:

Nagoya University, Professor (2004 - present)
Editorial Board, *Polymer Chemistry* (2013 - present), *Prog. Polym. Sci.* (2012 - present)

Recent Awards:

2014 Nagase Foundation Award
2010 Japan IBM Science Award
2009 SPSJ Wiley Award, Society of Polymer Science, Japan
2001 Arthur K. Doolittle Award, American Chemical Society, PMSE Division

Research Interests:

Living Radical Polymerization, Living Cationic Polymerization, Precision Polymer Synthesis, Precision Polymerization of Renewable Vinyl Monomers

Selected Representative Publications:

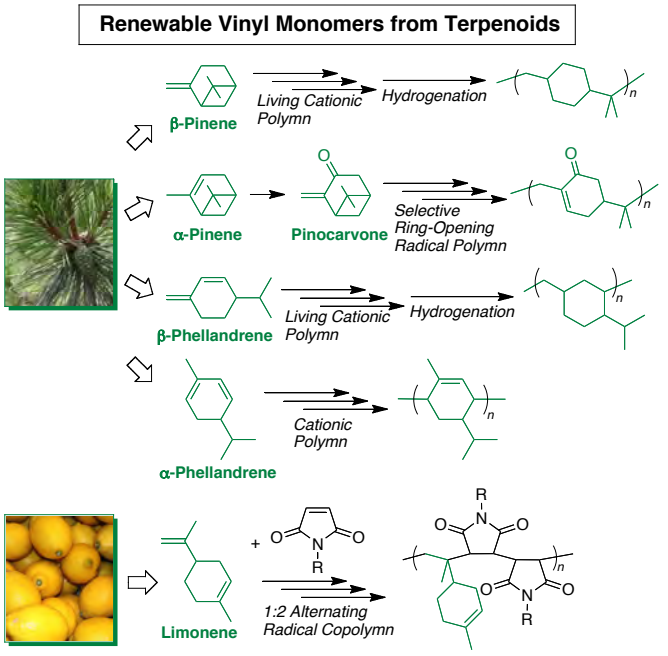
1. Soejima, T.; Satoh, K.; Kamigaito, M. "Main- and Side-Chain Sequence-Regulated Vinyl Copolymers by Iterative Atom Transfer Radical Additions and 1:1 or 2:1 Alternating Radical Copolymerization" *J. Am. Chem. Soc.* **2016**, *138*, 944-954.
2. Miyaji, H.; Satoh, K,; Kamigaito, M. "Bio-Based Polyketones by Selective Ring-Opening Radical Polymerization of α-Pinene-Derived Pinocarvone" *Angew. Chem. Int. Ed.* **2016**, *55*, 1372-1376.
3. Uchiyama, M.; Satoh, K,; Kamigaito, M. "Cationic RAFT Polymerization Using ppm Concentrations of Organic Acid" *Angew. Chem. Int. Ed.* **2015**, *54*, 1924-1938.
4. Aoshima, H.; Uchiyama, M.; Satoh, K.; Kamigaito, M. "Interconvertible Living Radical and Cationic Polymerization through Reversible Activation of Dormant Species with Dual Activity" *Angew. Chem. Int. Ed.* **2014**, *53*, 10932-10936.
5. Ren, J. M.; Satoh, K.; Goh, T. K.; Blencowe, A.; Nagai, K.; Ishitake, K.; Christofferson, A. J.; Yiapanis, G.; Yarovsky, I.; Kamigaito, M.; Giao, G. G. "Stereospecific Cyclic Poly(methyl Methacrylate) and Its Topology-Guided Hierarchically-Controlled Supramolecular Assemblies" *Angew. Chem. Int. Ed.* **2014**, *53*, 459-464.

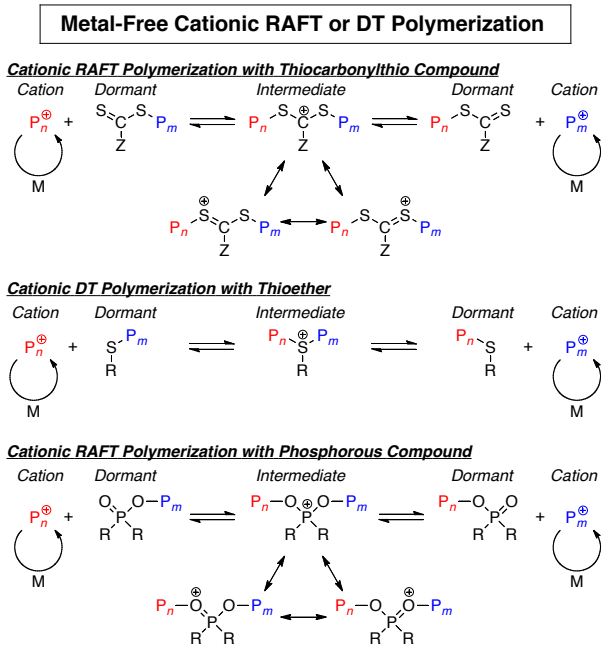
Controlled Radical and Cationic Polymerization for Sustainability

Masami Kamigaito

Department of Applied Chemistry
Graduate School of Engineering, Nagoya University
Furo-cho, Chikusa-ku, Nagoya 464-8603, Japan
Email: kamigait@apchem.nagoya-u.ac.jp

In view of polymer synthesis for a sustainable future, we have been developing efficient methods to convert abundant renewable vinyl monomers into bio-based polymers and novel controlled radical and cationic polymerization for functional polymer materials with controlled structures. This presentation will highlight our recent work on (1) controlled radical and cationic polymerization of renewable vinyl monomers from terpenoids[1-7] including α- and β-pinenes, limonene, and α- and β-phellandrenes and (2) metal-free cationic reversible addition-fragmentation chain transfer (RAFT) or degenerative transfer (DT) polymerization proceeding via stable sulfonium and phosphonium intermediates.[8-10]





References

1. Kamigaito, M.; Satoh, K. "*Bio-Based Hydrocarbon Polymers*", in *Encyclopedia of Polymeric Nanomaterials*, Kobayashi, S.; Müllen, K. eds., Springer, Germany, 2015, Vol. 1, pp. 109-118.
2. Satoh, K.; Sugiyama, H.; Kamigaito, M. *Green Chem.* **2006**, *8*, 878-882.
3. Satoh, K.; Nakahara, A.; Mukunoki, K.; Sugiyama, H.; Saito, H.; Kamigaito, M. *Polym. Chem.* **2014**, *5*, 3222-3230.
4. Miyaji, H.; Satoh, K.; Kamigaito, M. *Angew. Chem., Int. Ed.* **2016**, *55*, 1372-1376.
5. Satoh, K.; Matsuda, M.; Kamigaito, M. *J. Am. Chem. Soc.* **2010**, *132*, 10003-10005.
6. Matsuda, M.; Satoh, K.; Kamigaito, M. *J. Polym. Sci. Part A Polym. Chem.* **2013**, *51*, 1774-1785.
7. Matsuda, M.; Satoh, K.; Kamigaito, M. *Macromolecules* **2013**, *46*, 5473-5782.
8. Uchiyama, M.; Satoh, K.; Kamigaito, M. *Angew. Chem. Int. Ed.* **2015**, *54*, 1924-1938.
9. Uchiyama, M.; Satoh, K.; Kamigaito, M. *Macromolecules* **2015**, *48*, 5533-5542.
10. Uchiyama, M.; Satoh, K.; Kamigaito, M. *Polym. Chem.* **2016**, *7*, 1387-1396.

Curriculum Vitae

Name: **EMILY PENTER**

Date of Birth: August 31, 1983

Title: Assistant Professor

Affiliation: Case Western Reserve University
Department of Chemistry and Department of Macromolecular Science
Cleveland, OH, USA

Telephone, Fax, E-mail, Website: TEL +1-216-368-3697, FAX +1-216-368-3006
http://caslabs.case.edu/pentzer/

Education:

B.A.	Butler University, 2005
Ph.D.	Northwestern University, 2010
Postdoc	University of Massachusetts Amherst (Todd Emrick), 2010-2013

Current Appointments:

Case Western Reserve University, Assistant Professor (2013-present)

Recent Awards:

2015 CAREER Award, National Science Foundation
2015 Glennan Fellowship, Case Western Reserve University
2014 Doctoral New Investigator Award, ACS Petroleum Research Fund
2014 Carl Wittke Award for undergraduate teaching (nominee), CWRU
2010 Gelewitz Award, outstanding chemistry graduate student, Northwestern University
2006 Graduate Research Fellowship, National Science Foundation

Research Interests:

Janus particles, 2-D materials, novel polymer backbone chemistries, stimuli responsive systems, controlled small molecule crystallization, structure-property relationships, self assembly

Selected Representative Publications:

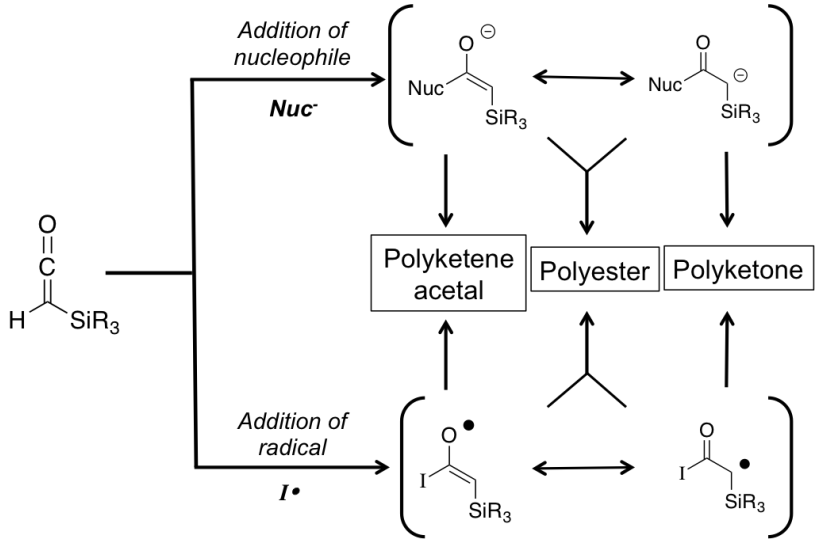
(1) Hollow microcapsules via stitching together of graphene oxide nanosheets with a di-functional small molecule. Luo, Q., Wei, P.; **Pentzer, E**. *in revisions*.
(2) Polythioether Particles Armored with Graphene Oxide Nanosheets. Rodier, B. J.; Mosher, E. P.; Burton, S. T.; Matthews, R.; **Pentzer, E**. *Macromol. Rap.Comm.*, **2016**, *online*.
(3) Selective Mono-facial Modification of Graphnee Oxide Nanosheets in Suspension. McGrail, B.T.; Magdelena, J.; Rodier, B.J.; Swisher, J.; Advincula, R.; **Pentzer, E**. *Chem Comm*. **2016**, 52, 288-291.
(4) Interfacial Trapping in an Aged Discotic Liquid Crystal Semiconductor. Dawson, N.; Patrick, M. S.; Paul, S.; Ellman, B.; Semyonov, A. R.; Twieg, R. J.; Matthews, R.; **Pentzer, E.**; Singer, K. D. *J. App. Phys*., **2015**, *118*, 085502.
(5) Polymer Composites for Thermoelectric Applications. McGrail, B.T.; Sehirlioglu, A.; **Pentzer, E.** *Angew. Chem.*, **2015**, *54*, 1710-1723.
(6) Rapid Covalent Functionalization of Graphene Oxide in Water. McGrail, B. T.; Rodier, B. J.; **Pentzer, E**. *Chem. Mater*. **2014**, *26*, 5806-5811.

Polymerization of Silyl Ketenes

Emily Pentzer

Department of Chemistry, Department of Macromolecular Science and Engineering
Case Western Reserve University
Cleveland, OH, USA
Email: ebp24@case.edu

Polymers play varied and vital roles in not only our daily lives, but also in high performance and specialized applications.[1] Among the variables that define the usefulness of a material, the chemical composition of polymer backbone is of the utmost importance. Indeed, the functional groups present on the polymer backbone dictate interchain interactions that define thermal and mechanical properties, as well as the ability of the polymer to degrade or self assemble. Common chain growth polymerization techniques yield hydrocarbon backbones with a variety of pendant groups (e.g., radical polymerization of terminal olefins and ring opening metathesis polymerization of strained cyclic olefins)[2,3] or hydrolysable polyesters (e.g., ring opening polymerization of lactones).[4] Here we present silyl ketenes as monomers for polymerization. Silyl ketenes are found to polymerize through both the carbon-carbon and carbon-oxygen double bonds to give novel backbone chemistries not accessible by other routes. The impact of solvent, temperature, catalyst, and silyl substituents on formation of polyketone, polyketene acetal, and polyester are reported. This work not only gives insight into the design principles for new monomers, but also yields polymers with unique properties and applications distinct from current materials.



References (7)

1. Odian, G. Principles of Polymerization. Wiley, **2004**. Print.
2. Matyjaszewski, K. Controlled Radical Polymerization: State-of-the-Art in 2014 in *Controlled Radical Polymerization: Mechanisms*, **2015**, 1-17.
3. Chang, A. B.; Miyake, G. M.; Grubbs, R. H. Sequence-Controlled Polymers by Ruthenium-Mediated Ring-Opening Metathesis Polymerization in *Sequence-Controlled Polymers: Synthesis, Self-Assembly, and Properties*, **2014**, 161-188.
4. Sarazin, Y.; Carpentier, J.-F. Discrete Cationic Complexes for Ring-Opening Polymerization Catalysis of Cylcic Esters and Epoxides, *Chem. Rev*. **2015**, 115, 3564-3614.

Curriculum Vitae

Name: **MAKOTO OUCHI**

Date of Birth: April 8, 1973

Title: Associate Professor

Affiliation: Kyoto University, Graduate School of Engineering,
Department of Polymer Chemistry
Nishikyo-ku, Kyoto 615-8510, Japan

Telephone, Fax, E-mail, Website: TEL +81-75-383-7127, FAX +81-75-383-2603
ouchi@living.polym.kyoto-u.ac.jp; http://living.polym.kyoto-u.ac.jp/index.html

Education: B.A. Kyoto University, 1996
Ph.D. Kyoto University, 2001

Current Appointments:

Kyoto University, Associate Professor (2010 - present)
JST-PRESTO Researcher (2013 - present)

Recent Awards:

2012 Polymer Journal Zeon Award
2011 Young Scientist Prize of the Annual Kobe Polymer Research Symposium

Research Interests:

Precision Polymerizations, Polymerization Catalysts, Control of Sequence, and Ring Polymers

Selected Representative Publications:

1. Hibi, Y.; Ouchi, M.; Sawamoto, M., A Strategy for Sequence Control in Vinyl Polymers via Iterative Controlled Radical Cyclization. *Nat. Commun.,* **2016**, 7:11064 doi: 10.1038/ncomms11064.
2. Fujimura, K.; Ouchi, M.; Sawamoto, M., Ferrocene Cocatalysis for Iron-Catalyzed Living Radical Polymerization: Active, Robust, and Sustainable System under Concerted Catalysis by Two Iron Complexes. *Macromolecules* **2015**, *48*, 4294-4300.
3. Lutz, J. F.; Ouchi, M.; Liu, D. R.; Sawamoto, M., Sequence-Controlled Polymer. *Science* **2013**, *341* (6146) DOI: 10.1126/science.1238149.
4. Kammiyada, H.; Konishi, A.; Ouchi, M.: Sawamoto, M., Ring-Expansion Living Cationic Polymerization via Reversible Activation of a Hemiacetal Ester Bond. *ACS Macro. Lett.,* **2013**, *2* (6), 531-534.
5. Ouchi, M.; Badi, N.; Lutz, J. F.; Sawamoto, M. Single-Chain Technology Using Discrete Synthetic Macromolecules. *Nat. Chem.* **2011**, 3, 917-924.

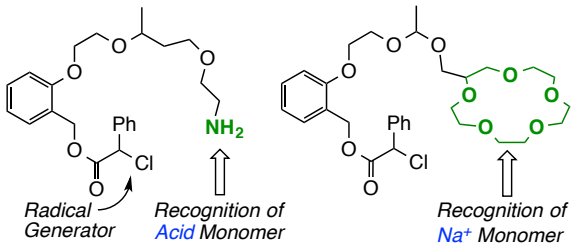
Macromolecular Technology to Control

Side-Chain Sequence and Main-Chain Topology

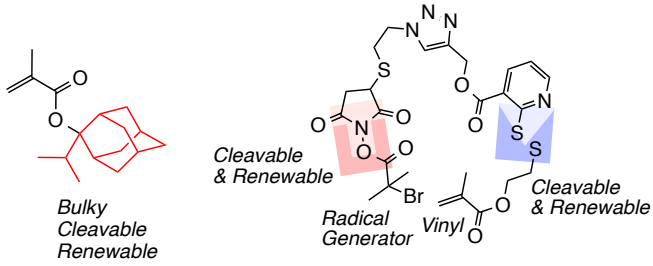
Makoto Ouchi

Department of Polymer Chemistry
Graduate School of Engineering, Kyoto University
Nishikyo-ku, Kyoto 615-8510, Japan
Email: ouchi@living.polym.kyoto-u.ac.jp

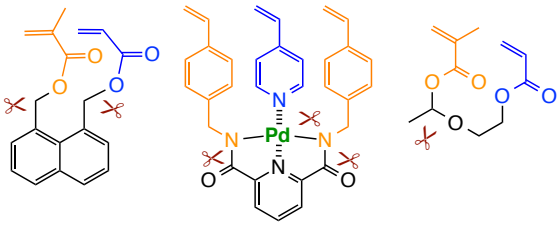
Biopolymers such as DNA and proteins are expressing their functions based on sequence and position of functional groups in the pendant as well as shape (topology) of the main chain. On the other hand, for synthetic polymers, control of topology and sequence is still extremely difficult, although that of chain length (molecular weight) and terminal groups is now possible using living polymerizations. Our efforts have been directed to control of side-chain sequence and main-chain topology for vinyl polymers via macromolecular technology with strategic molecular design for initiators and monomers as follows: initiators having a recognition site for a special monomer,[1,2] template monomers to control alternating copolymers;[3,4] monomer or inimer to control sequence for vinyl polymers;[5] hemiacetal ester-based cyclic initiators for ring-expansion polymerizations.[6-7]



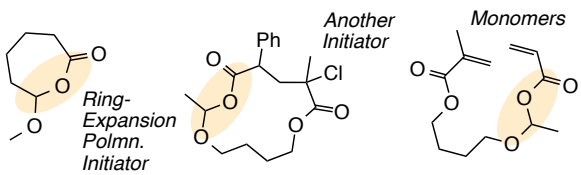
Selective Radical Addition



Sequence Controll (as you like)



Alternating Copolymers



Ring-Based Copolymers

References

1. Ida, S.; Terashima, T.; Ouchi, M.; Sawamoto, M. *J. Am. Chem. Soc.* **2009**, *131*, 10808-10809.
2. Ida, S.; Ouchi, M.; Sawamoto, M. *J. Am. Chem. Soc.* **2010**, *132*, 14748-14750.
3. Hibi, Y.; Tokuoka, S.; Terashima, T.; Ouchi, M.; Sawamoto, M. *Polym. Chem.* **2011**, *1*, 341-347.
4. Hibi, Y.; Ouchi, M.; Sawamoto, M. *Angew. Chem. Int. Ed.* **2011**, *50(32)*, 7434-7437.
5. Hibi, Y.; Ouchi, M.; Sawamoto, M., *Nat. Commun.*, **2016**, 7:11064 doi: 10.1038/ncomms11064.
6. Kammiyada, H.; Konishi, A.; Ouchi, M.; Sawamoto, M. *ACS Macro Letters* **2013**, *2*, 531–534.
7. Kammiyada, H.; Ouchi, M.; Sawamoto, M. *Macromol Symp.*, **2015**, *350*, 105-116.

Curriculum Vitae

Name: **CRAIG J. HAWKER**

Date of Birth: January 11, 1964

Title: Professor

Affiliation: University of California, Santa Barbara,
Materials Department
Santa Barbara, CA, USA

Telephone, Fax, E-mail, Website: TEL 805-893-7161
hawker@mrl.ucsb.edu; http://hawkergroup.mrl.ucsb.edu/

Education:

B.Sc.	University of Queensland, 1984
Ph.D.	University of Cambridge, 1988
Postdoc	Cornell University (Jean M.J. Fréchet), 1988 - 1990

Current Appointments:

University of California, Professor (2004 - present)
IBM Almaden Research Ceneter, Research Staff Member (1993-2004)

Recent Awards:

2016	Elected Member of the National Academy of Inventors
2015	Elected as Fellow: American Association for the Advancement of Science (AAAS)
2013	ACS Award in Polymer Chemistry, American Chemical Society
2013	Elected Fellow, Royal Society of Chemistry
2012	Centenary Prize, Royal Society of Chemistry

Research Interests:

Synthetic Polymer Chemistry, Nanotechnology--Materials science that integrates fundamental studies with the development of nanostructured materials for advanced properties and functions in microelectronics and biotechnology

Selected Representative Publications:

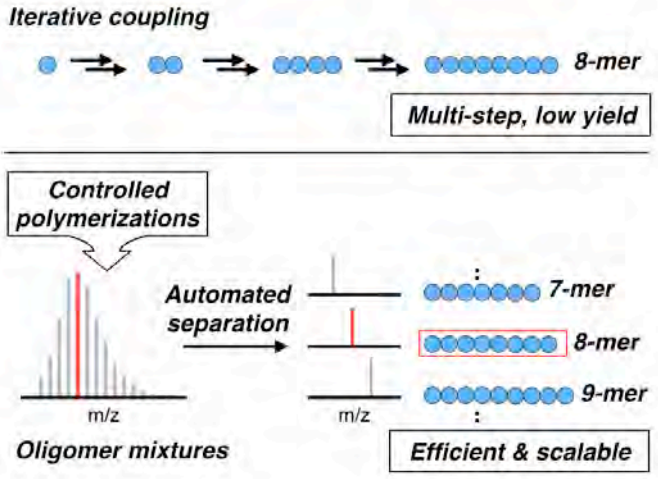
1. Russ, B.; Robb, M.J.; Popere, B.C.; Perry, E.E.; Mai, C.K.; Fronk, S.L.; Patel, S.N.; Mates, T.E.; Bazan, G.C.; Urban, J.J.; Chabinyc, M.L.; Hawker, C.J.; Segalman, R.A. "More Tethered tertiary amines as solid-state n-type dopants for solution-processable organic semiconductors", *Chem. Sci.*, **2016**, *7*, 1914-1919.
2. Chiu, C.Y.; Wang, H.B.; Phan, H.; Shiratori, K.; Nguyen, T.Q.; Hawker, C.J. "Twisted Olefinic Building Blocks for Low Bandgap Polymers in Solar Cells and Ambipolar Field-Effect Transistors", *J. Polym. Sci., Polym. Chem.*; **2016**, *54*, 889-899.
3. Discekici, E.H.; Pester, C.W.; Treat, N.J.; Lawrence, J.; Mattson, K.M.; Narupai, B.; Toumayan, E.P.; Luo, Y.D.; McGrath, A.J.; Clark, P.G.; de Alaniz, J.R.; Hawker, C.J., "Simple Benchtop Approach to Polymer Brush Nanostructures Using Visible-Light-Mediated Metal-Free Atom Transfer Radical Polymerization", *ACS Macro Letters*, **2016**, *5*, 258-262.
4. Kempe, K.; Wylie, R.A.; Dimitriou, M.D.; Tran, H.; Hoogenboom, R.; Schubert, U.S.; Hawker, C.J.; Campos, L.M.; Connal, L.A., "Preparation of non-spherical particles from amphiphilic block copolymers", *J. Polym. Sci., Polym. Chem.*; **2016**, *54*, 750-757.
5. Kang, T.; Banquy, X.; Heo, J.H.; Lim, C.N.; Lynd, N.A.; Lundberg, P.; Oh, D.X.; Lee, H.K.; Hong, Y.K.; Hwang, D.S.; Waite, J.H.; Israelachvili, J.N.; Hawker, C.J. "Mussel-Inspired Anchoring of Polymer Loops That Provide Superior Surface Lubrication and Antifouling Properties", *ACS NANO*, **2016**, *10*, 930-937.

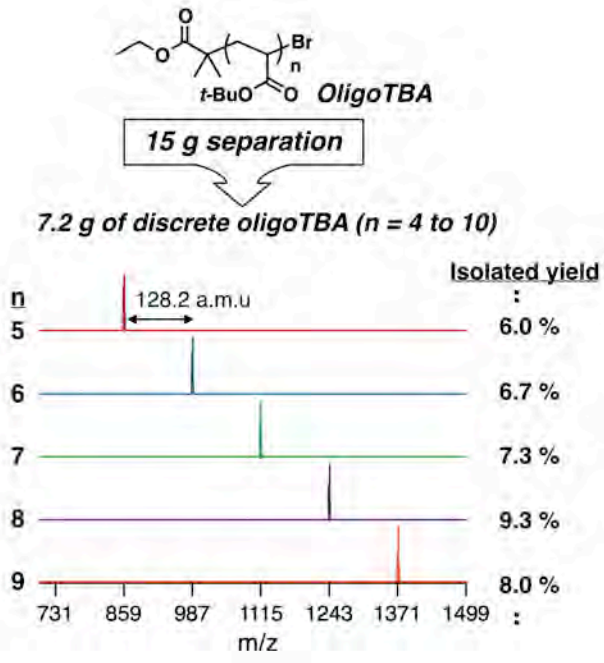
Accurate Control of Polymer Structure and Function

Craig J. Hawker

Materials Department
University of California, Santa Barbara
USA
Email: hawker@mrl.ucsb.edu

A versatile strategy will be described for the multi-gram synthesis of discrete oligomers from commercially available monomer families, e.g., acrylates, styrenics, siloxanes. Central to this strategy is the identification of reproducible procedures for the separation of oligomer mixtures using automated flash chromatography systems with the effectiveness of this approach demonstrated through the multi-gram preparation of discrete oligomer libraries ($Đ$ = 1.0). Synthetic availability, coupled with accurate structural control, allows these functional building blocks to be harnessed for both fundamental studies as well as targeted technological applications.





Curriculum Vitae

Name: **MICHINORI SUGINOME**

Date of Birth: February 18, 1966

Title: Professor

Affiliation: Kyoto University, Graduate School of Engineering,
Department of Synthetic Chemistry and Biological Chemistry
Katsura, Nishikyo-ku, Kyoto 615-8510, Japan

Telephone, Fax, E-mail, Website: TEL +81-75-383-2723, FAX +81-75-383-2722
suginome@sbchem.kyoto-u.ac.jp; http://www.sbchem.kyoto-u.ac.jp/suginome-lab/

Education: B.A. Kyoto University, 1988
Ph.D. Kyoto University, 1993
Visiting Researcher MIT (Gregory C. Fu), 1998 - 1999

Current Appointments:
Kyoto University, Professor (2004 - present)

Recent Awards:
2015 The Humboldt Research Award
2013 The Chemical Society of Japan Award for Creative Work
2010 JSPS Prize
2005 Mukaiyama Award
2005 Nagoya Silver Medal

Research Interests:
Discovery of New Catalytic Reactions, Organic Synthesis via Organoboronates, Asymmetric Synthesis, and Synthesis and Function Discovery of Single-handed Helical Macromolecules

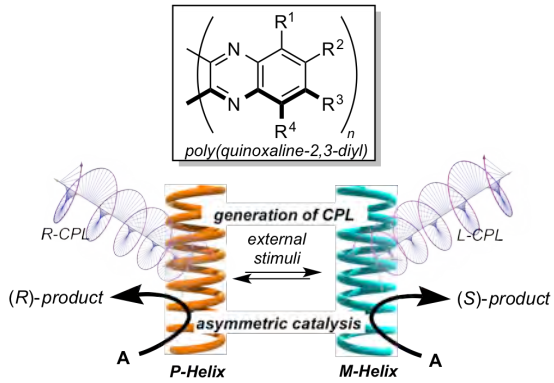
Selected Representative Publications:
1. Nagata, Y.; Uno, M.; Suginome, M. "Three-Way Switchable (Right/Left/OFF) Selective Reflection of Circular Polarized Light on Solid Thin Films of Helical Polymer Blends" *Angew. Chem., Int. Ed.* **2016**, in press.
2. Ke, Y.-Z.; Nagata, Y.; Yamada, T.; Suginome, M., "Majority-Rule-Type Poly(quinoxaline-2,3-diyl)s as Highly Efficient Chiral Amplification System for Asymmetric Catalysis" *Angew. Chem., Int. Ed.,* **2015***,* 54, 9333-9337.
3. Nagata, Y.; Nishikawa, T.; Suginome, M., "Exerting Control over the Helical Chirality in the Main-Chain of Segeants-and-Soldiers-Type Poly(quinoxaline-2,3-diyl)s by Changing from Random to Block Copolymerization Protocols", *J. Am. Chem. Soc*. **2015**, *137*, 4070-4073.
4. Ohmura, T.; Morimasa, Y.; Suginome, M. "Organocatalytic Diboration Involving "Reductive Addition" of a Boron–Boron σ-Bond to 4,4'-Bipyridine" *J. Am. Chem. Soc*. **2015**, *137*, 2852-2855.
5. Nagata, Y.; Nishikawa, T.; Suginome, M. "Poly(quinoxaline-2,3-diyl)s Bearing (S)-3-Octyloxymethyl Side Chains as an Efficient Amplifier of Alkane Solvent Effect Leading to Switch of Main Chain Helical Chirality" *J. Am. Chem. Soc*., **2014***, 136,* 15901-15904.
6. Nagata, Y.; Takagi, K.; Suginome, M. "Solid Polymer Films Exhibiting Handedness-switchable, Full-color-tunable Selective Reflection of Circularly Polarized Light" *J. Am. Chem. Soc*. **2014**, *136*, 9858–9861.
7. Yamamoto, T.; Akai, Y.; Suginome, M. "Chiral Palladacycle Catalysts Generated on a Single-handed Helical Polymer Skeleton for Asymmetric Arylative Ring Opening of 1,4-Epoxy-1,4-Dihydronaphthalene" *Angew. Chem. Int. Ed.* **2014***, 53*, 12785-12788.

Poly(quinoxaline-2,3-diyl): A Single-Handed Helical Polymer Platform for Creating New Chiral Functions

Michinori Suginome

Department of Synthetic Chemistry and Biological Chemistry
Graduate School of Engineering, Kyoto University
Katsura, Nishikyo-ku, Kyoto 615-8510, Japan
Email: suginome@sbchem.kyoto-u.ac.jp

Increasing attention has been paid to the study of single-handed helical polymers, aiming to find new molecular and supramolecular functions on the basis of their characteristic chiral backbone structures. We have recently established poly(quinoxaline-2,3-diyl)s (PQX) bearing chiral side chains as a new polymer scaffold that undergoes reversible switch of its helical conformation by external stimuli such as solvent effect.[1] By accommodating pendant groups for coordination to transition metals, the chirality-switchable polymer serves as new chiral ligands in transition-metal catalyzed asymmetric reactions, which are able to produce either enantiomeric products with high enantioselectivities.[2] Furthermore, incorporation of haloalkyl side chains into the polyquinoxaline scaffolds afforded a new solid polymer film, which shows physical color on the basis of selective reflection of visible light by the formation of cholesteric supramacromolecular structure.[3] The color and the handedness of the reflected circularly polarized light (CPL) can be switched reversibly by tuning composition of the polymers as well as external stimuli.[4]



References

1. (a) Yamada, T.; Nagata, Y.; Suginome, M. *Chem. Commun.* **2010**, *46*, 4914. (b) Nagata, Y.; Yamada, T.; Adachi, T.; Akai, Y.; Yamamoto, T.; Suginome, M. *J. Am. Chem. Soc.* **2013**, *135*, 10104. (c) Nagata, Y.; Nishikawa, T.; Suginome, M. *J. Am. Chem. Soc.* **2014**, *136*, 15901. (d) Nagata, Y.; Nishikawa, T.; Suginome, M. *J. Am. Chem. Soc.* **2015**, *137*, 4070
2. (a) Yamamoto, T.; Suginome, M. *Angew. Chem., Int. Ed.* **2009**, *48*, 539. (b) Yamamoto, T.; Yamada, T.; Nagata, Y.; Suginome, M. *J. Am. Chem. Soc.* **2010**, *132*, 7899. (c) Yamamoto, T.; Akai, Y.; Nagata, Y.; Suginome, M. *Angew. Chem., Int. Ed.* **2011**, *50*, 8844. (d) Akai, Y.; Yamamoto, T.; Nagata, Y.; Ohmura, T.; Suginome, M. *J. Am. Chem. Soc.* **2012**, *134*, 11092. (e) Yamamoto, T.; Akai, Y.; Suginome, M. *Angew. Chem., Int. Ed.* **2014**, *53*, 12785. (f) Akai, Y.; Konnert, L., Yamamoto, T.; Suginome, M. *Chem. Commun.* **2015**, *51*, 7211. (g) Ke, Y.-Z.; Nagata, Y.; Suginome, M. *Angew. Chem., Int. Ed.* **2015**, *54*, 9333.
3. (a) Nagata, Y.; Takagi, K.; Suginome, M. *J. Am. Chem. Soc.* **2014**,*136,* 9858. (b) Nagata, Y.; Uno, M.; Suginome, M. *Angew. Chem., Int. Ed.* **2016**, in press.
4. Account: Suginome, M.; Yamamoto, T.; Nagata, Y. *J. Synth. Org. Chem. Jpn.* **2015**, *73*, 1141. [open access]

Curriculum Vitae

Name: **ROBERT M. WAYMOUTH**

Date of Birth: May 20, 1960

Title: Robert Eckles Swain Professor of Chemistry

Affiliation: Stanford University, Department of Chemistry
Stanford, CA 94305

Telephone, Fax, E-mail, Website: TEL. 650 723 4515, FAX 650 729-0259, waymouth@stanford.edu

http://web.stanford.edu/group/waymouth/Waymouth_Research_Group/Home.html

Education: B.A.. B.S Washington and Lee University, 1982
Ph.D. Caltech, 1987
Postdoc ETH, Zurich (Piero Pino), 1987-1988

Current Appointments:
Stanford University, Robert Eckles Swain Professor (2000 - present)

Recent Awards:
2012 Presidential Green Chemistry Challenge Award
2009 Cooperative Research Award in Polymer Science
2005 Bass University Fellow in Undergraduate Education
2001 Alexander Von Humboldt Senior Scientist Award
1996 Alan T. Waterman Award, NSF
1995 Arthur C. Cope Scholar Award, ACS

Research Interests:
Catalysis, Organocatalysis for Polymer Chemistry, Biodegradable and Sustainable Polymers

Selected Representative Publications:

1) Shin, E. J.; Brown, H. A.; Gonzalez, S.; Jeong, W.; Hedrick, J. L.; Waymouth, R. M. "Zwitterionic Copolymerization: Synthesis of Cyclic Gradient Copolymers" *Angew. Chem., Int. Ed.* **2011**, *50*, 6388-6391.
2) Geihe, E. I.; Cooley, C. B.; Simon, J.; Kiesewetter, M. K.; Edward, J. A.; Hickerson, R. P.; Kaspar, R. L; Hedrick, J. L.; Waymouth, R. M.; Wender, P. A., "Designed guanidinium-rich amphipathic oligocarbonate molecular transporters complex, deliver and release siRNA in cells" *Proc. Nat. Acad. Sci.* **2012**, *109(33),* 13171-13176
3) Venkataraman, S.; Ng, V. W. L.; Coady, D. J.; Horn, H. W.; Jones, G. A.; Fung, T. S.; Sardon, H.; Waymouth, R. M.; Hedrick, J. L.; Yang, Y. Y. "A Simple and Facile Approach to Functional Eight-Membered Aliphatic Cyclic Carbonates and Their Organo-catalytic Polymerization" *J. Am. Chem. Soc.* **2015**, *137*, 13851-13860.
4) Ingram, A. J.; Walker, K. L.; Zare, R. N.; Waymouth, R. M. "Catalytic Role of Multinuclear Palladium-Oxygen Intermediates in Aerobic Oxidation Followed by Hydrogen Peroxide Disproportionation" *J. Am. Chem. Soc.* **2015**, *137*, 13632-13646

Catalysis as an Enabling Science for Monomer and Polymer Synthesis

Robert Waymouth

Department of Chemistry
Stanford University
Stanford, CA 94305
Email: waymouth@stanford.edu

Catalysis has proven an enabling science for monomer synthesis from readily available feedstocks and for the selective polymerization of those monomers to useful materials. We have discovered a class of selective Pd catalysts for the oxidation of biomass-derived polyols to chemical intermediates and monomers.[1,2] With James Hedrick of IBM, we have developed a family of organic catalysts for selective ring-opening polymerization reactions that are fast, selective and tolerant to a wide variety of functionalized monomers.[3,4,5] These advances have enabled an integrated catalytic strategy for the conversion of renewable resources into renewable polymers and functional materials.[5,6] Mechanistic and kinetic studies have revealed important details of these reactions which illuminate the scope and limitations of these catalytic strategies for the synthesis of macromolecules with novel topologies,[7] structure[5] and function.[8]

References

1. Painter, R. M., Pearson, D. M., Waymouth, R. M. "Selective catalytic oxidation of glycerol to dihydroxyacetone" *Angew. Chem., Int. Ed.* **2010**, *49*, 9456-9459.
2. Chung, K.; Banik, S. M.; De Crisci, A. G.; Pearson, D. M.; Blake, T.; Olsson, J. V.; Ingram, A. J.; Zare, R. N.; Waymouth, R. M. "Chemoselective Pd-catalyzed Oxidation of Polyols: Synthetic Scope and Mechanistic Studies" *J. Am. Chem. Soc.*, **2013**, *135*, 7593-7602.
3. Kiesewetter, M. K.; Shin, E. J.; Hedrick, J. L.; Waymouth. R. M. "Organocatalysis: Opportunities and Challenges for Polymer Synthesis" *Macromolecules*, **2010**, *43*, 2093-2107.
4. Blake, T.; Waymouth, R. M. " Organocatalytic Ring Opening Polymerization of Morpholinones: New Strategies to Functionalized Polyesters " *J. Am. Chem. Soc.*, **2014**, *136*, 9252-9255.
5. Barcan, G. A.; Zhang, X.; Waymouth, R. M. "Covalent Adaptable Networks derived from Dithiolanes: Deformable Hydrogels." *J. Am. Chem. Soc.* **2015**, *137*, 5650-5653.
6. Simon, J.; Olsson, J. V.; Kim, H.; Tenney, I. F.; Waymouth, R. M. "Semicrystalline Dihydroxyacetone Copolymers Derived from Glycerol " *Macromolecules*, **2012**, *45*, 9275-9281.
7. Brown, H. A.; Waymouth, R. M. "Zwitterionic Ring-Opening Polymerization for the Synthesis of High Molecular Weight Cyclic Polymers" *Acc. Chem. Res.* **2013**, *46*, 2585-2596.
8. McKinlay, C. J., Waymouth, R. M.; Wender, P.A. "Cell-Penetrating, Guanidinium-Rich Oligophosphoesters: Effective and Versatile Molecular Transporters for Drug and Probe Delivery", *J. Am. Chem. Soc.*, **2016**, *138*, 3510-3517.

Curriculum Vitae

Name: **KYOKO NOZAKI**

Date of Birth: February 9, 1964

Title: Professor

Affiliation: The University of Tokyo, Graduate School of Engineering,
Department of Chemistry and Biotechnology
Hongo, Bunkyo-ku, Tokyo 113-8656, Japan

Telephone, Fax, E-mail, Website: TEL +81-3-5841-7261, FAX +81-3-5841-7263
nozaki@chembio.t.u-tokyo.ac.jp; http://park.itc.u-tokyo.ac.jp/nozakilab/indexE.html

Education: B.A. Kyoto University, 1986
Ph.D. Kyoto University, 1991

Current Appointments:
The University of Tokyo, Professor (2003 - present)

Recent Awards:
2015 ACS, The Arthur K. Doolittle Award
2013 The Award of the Society of Polymer Science, Japan
2013 Schlenk Lecturer, Universität Tübingen
2012 ACS 2012 Organometallic Lecturer
2009 Nagoya Silver Medal
2009 Mitsui Chemicals Catalysis Science Award
2008 Mukaiyama Award
2008 Saruhashi Award
2003 OMCOS prize

Research Interests:
Development of homogeneous catalysis for bulk materials and polymers

Selected Representative Publications:
1. Ota, Y.; Ito, S.; Kobayashi, M.; Kitade, S.; Sakata, K.; Tayano, T.; Nozaki, K..”Crystalline Isotactic Polar Polypropylene from the Palladium-Catalyzed Copolymerization of Propylene and Polar Monomers” *Angew. Chem., Int. Ed.* **2016**, *in press*.
2. Ota, Y.; Murayama, T.; Nozaki, K.” One-step catalytic asymmetric synthesis of all-/syn/deoxypropionate motif from propylene: Total synthesis of (-)tetramethyldecanoic acid” *Proc. Natl. Acad. Sci. USA*, **2016**, *113*, 2857-2861.
3. Tao, W.; Nakano, R.; Ito, S.; Nozaki, K. “Copolymerization of Ethylene and Polar Monomers Using Ni/IzQO Catalysts” *Angew. Chem. Int. Ed*., **2016**, *55*, 2835-2839.
4. Nakano, R.;, Nozaki, K.” Copolymerization of Propylene and Polar Monomers Using Pd/IzQO Catalysts” *J. Am. Chem. Soc.* **2015**, *137*, 10934-10937.
5. Kusumoto, S.; Nozaki, K. “Direct and Selective Hydrogenolysis of Arenols and Aryl Methyl Ethers” *Nat. Commun*., **2015**, *6*: 6296 .
6. Nakano, R.;, Nozaki, “Copolymerization of Carbon Dioxide and Butadiene via a Lactone Intermediate” *Nature Chem*. **2014**, 6, 325-331.

New Aspects of Stereocontrolled Propylene Polymerization and Oligomerization

Kyoko Nozaki

Department of Chemistry and Biotechnology
The University of Tokyo
Hongo 7-3-1 Bunkyo-ku, Tokyo 113-8656, Japan
Email: nozaki@chembio.u-tokyo.ac.jp

Control over regio- and stereoregularity has been crucial in any type of propylene polymerization catalysts, such as Ziegler-Natta, metallocene, and post-metallocene catalysts.. In addition to the homopolymerization, the late transition metal catalyzed copolymerization of olefins and polar monomers has recently emerged as a powerful method for the synthesis of functional polyolefins. Despite the substantial progress in this area, most catalytic systems are still restricted to the copolymerization of ethylene and polar monomers, and examples of the copolymerization of propylene and polar monomers remain scarce.[1] Here we report moderately isospecific homopolymerization of propylene and the copolymerization of propylene and polar monomers has been achieved with palladium complexes bearing a phosphine-sulfonate ligand. Optimization of substituents on the phosphorus atom of the ligand revealed that the presence of bulky alkyl groups (e.g. menthyl) is crucial for the generation of high-molecular-weight polypropylenes ($M_w \approx 10^4$).[2]

Propylene polymerization was also successfully applied to natural product synthesis. Here we show the construction of the deoxypropionate structure from propylene in a single step to achieve a three-step synthesis of (2*R*,4*R*,6*R*,8*R*)-2,4,6,8-tetramethyldecanoic acid, a major acid component of a preen-gland wax of the graylag goose. Furthermore, multiple oligomers with different number of deoxypropionate units were isolated from one batch, showing application to the construction of library.[3]

References

1. Nakano, R.;, Nozaki, K. *J. Am. Chem. Soc.* **2015**, *137*, 10934-10937.
2. Ota, Y.; Ito, S.; Kobayashi, M.; Kitade, S.; Sakata, K.; Tayano, T.; Nozaki, K.. *Angew. Chem., Int. Ed.* **2016**, *in press*.
3. Ota, Y.; Murayama, T.; Nozaki, K. *Proc. Natl. Acad. Sci. USA*, **2016**, *113*, 2857-2861.

.

Curriculum Vitae

Name: **GEOFFREY W. COATES**

Date of Birth: October 12, 1966

Title: Tisch University Professor

Affiliation: Cornell University, Dept. of Chemistry and Chem. Bio.
Baker Laboratory, Ithaca NY 14853-1301 USA

Telephone, Fax, E-mail, Website: TEL. +1-607-255-5447
coates@cornell.edu
http://coates.chem.cornell.edu

Education: B.A. Wabash College, 1989
Ph.D. Stanford University (Robert M. Waymouth), 1994
Postdoc California Institute of Technology (Robert H. Grubbs), 1997

Current Appointments:

Cornell University, Tisch University Professor (2008 – present)
Associate Editor, *Macromolecules* (July 2008 – present)
Co-Founder and Scientific Advisor, Novomer (2005 – present)
Co-Founder and Scientific Advisor, eColectro (2015 – present)

Recent Awards:

2016 Kathryn C. Hach Award for Entrepreneurial Success, American Chemical Society
2015 Award in Applied Polymer Chemistry, American Chemical Society
2012 Presidential Green Chemistry Challenge Award
2012 DSM Performance Materials Award
2011 Election to American Academy of Arts & Sciences
2011 World's Top 100 Chemists, 2000-2010, Thomson Reuters

Research Interests:

Metal-catalyzed Polymerization, Precision Polymer Synthesis, Biodegradable Polymers, Sustainable Polymers

Selected Representative Publications:

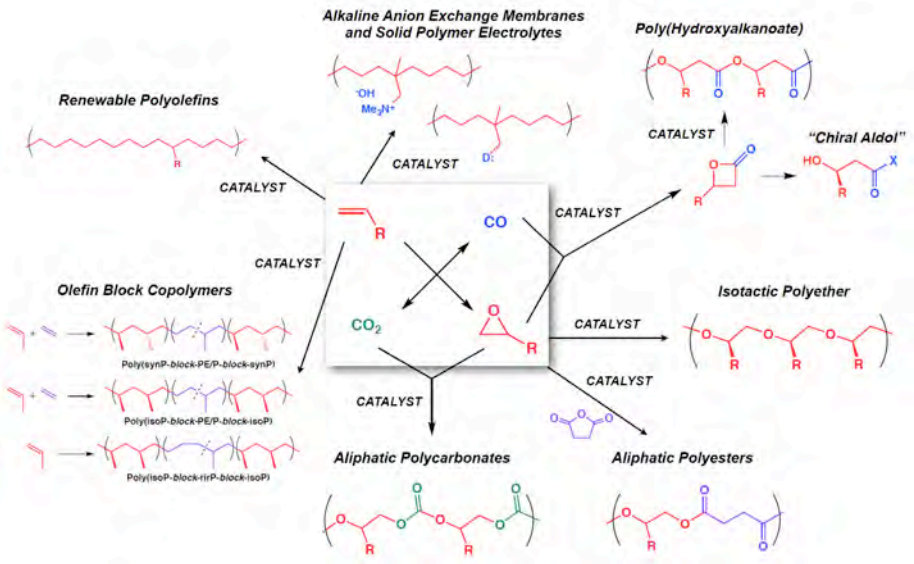
1. Vaidya, T.; Klimovica, K.; LaPointe, A. M.; Keresztes, I.; Lobkovsky, E. B.; Daugulis, O.; Coates, G. W. "Secondary Alkene Insertion and Precision Chain-Walking: A New Route to Semicrystalline "Polyethylene" from Underutilized α -Olefins by Combining Two Rare Catalytic Events" *J. Am. Chem. Soc.* **2014**, *136*, 7213–7216.
2. Longo, J. M.; DiCiccio, A. M.; Coates, G. W. "Poly(propylene succinate): A New Polymer Stereocomplex" *J. Am. Chem. Soc.* **2014**, *136*, 15897−15900.
3. Khurana, R.; Schaefer, J. L.; Archer, L. A.; Coates, G. W. "Suppression of Lithium Dendrite Growth Using Cross-Linked Polyethylene/Polyethylene Oxide Electrolytes: A New Approach for Practical Lithium-Metal Polymer Batteries" *J. Am. Chem. Soc.* **2014**, *136*, 7395–7402.
4. Ahmed, S. M.; Childers, M. I.; Widger, P. C. B.; LaPointe, A. M.; Keresztes, I.; Lobkovsky, E. B.; Coates, G. W. "Enantioselective Polymerization of Epoxides Using Biaryl-Linked Bimetallic Cobalt Catalysts: A Mechanistic Study" *J. Am. Chem. Soc.* **2013**, *135*, 18901–18911.
5. Noonan, K. J. T.; Hugar, K. M.; Kostalik IV, H. A.; Lobkovsky, E. B.; Abruña, H. D.; Coates, G. W. "Phosphonium Functionalized Polyethylene: A New Class of Base Stable Alkaline Anion Exchange Membranes" *J. Am. Chem. Soc.* **2012**, *134*, 18161–18164.

Advances in Catalysis for Polymer Synthesis

Geoffrey W. Coates

Cornell University, Department of Chemistry and Chemical Biology
Baker Laboratory, Ithaca NY 14853-1301 USA
Email: coates@cornell.edu

Society depends on polymeric materials now more than at any other time in history. Although synthetic polymers are indispensable in a diverse array of applications, ranging from commodity packaging and structural materials to technologically complex biomedical and electronic devices, their synthesis and post-use fate pose important environmental challenges. The focus of our research is the development of new routes to polymers with reduced environmental impact. In this work, we aim to transition from fossil fuels to renewable resources, and are developing synthetic methods that limit energy and raw-material consumption. In addition, we are designing materials that will eventually degrade into non-toxic materials, and have properties comparable to current commodity plastics. In this lecture, the development of new methods for the synthesis of sustainable polymers will be presented.



References

1. Van Zee, N. J.; Sanford, M. J.; Coates, G. W. "Electronic Effects of Aluminum Salph Complexes in the Copolymerization of Propylene Oxide with Tricyclic Anhydrides: Access to Well-Defined, Functionalizable Aliphatic Polyesters" *J. Am. Chem. Soc.* **2016**, *138*, 2755−2761.
2. Long, B. K.; Eagan, J. M.; Mulzer, M.; Coates, G. W. "Semi-Crystalline Polar Polyethylene: Ester-Functionalized Linear Polyolefins Enabled by a Functional Group Tolerant, Cationic Nickel Catalyst" *Angew. Chem. Int. Ed.* **2016**, *55*, *in press*.
3. Cowman, C. D.; Padgett, E.; Tan, K. W.; Hovden, R.; Gu, Y.; Andrejevic, N.; Muller, D.; Coates, G. W.; Wiesner, U. B. "Multicomponent Nanomaterials with Complex Networked Architectures from Orthogonal Degradation and Binary Metal Backfilling in ABC Triblock Terpolymers" *J. Am. Chem. Soc.* **2015**, *137*, 6026–6033.
4. Vaidya, T.; Klimovica, K.; LaPointe, A. M.; Keresztes, I.; Lobkovsky, E. B.; Daugulis, O.; Coates, G. W. "Secondary Alkene Insertion and Precision Chain-Walking: A New Route to Semicrystalline "Polyethylene" from Underutilized α -Olefins by Combining Two Rare Catalytic Events" *J. Am. Chem. Soc.* **2014**, *136*, 7213–7216.
5. Longo, J. M.; DiCiccio, A. M.; Coates, G. W. "Poly(propylene succinate): A New Polymer Stereocomplex" *J. Am. Chem. Soc.* **2014**, *136*, 15897−15900.

Curriculum Vitae

Name: **TAMAKI NAKANO**

Date of Birth: August 24, 1962

Title: Professor

Affiliation: Macromolecular Science Research Division,
Department of Fundamental Research,
Institute for Catalysis, Hokkaido University,
21W10, Kita-ku, Sapporo 001-0021, Japan

Telephone, Fax, E-mail, Website: TEL +81-52-706-9155, FAX +81-11-706-9156
tamaki.nakano@cat.hokudai.ac.jp; http://polymer.cat.hokudai.ac.jp/**Education**:

B.A. Osaka University, 1986
Ph.D. Osaka University, 1991
Postdoc Cornell University (Dotsevi Sogah), 1993 - 1994

Current Appointments:

Hokkaido University, Professor (2006 - present)

Recent Awards:

2009 Award of The Society of Polymer Science, Japan
1996 The Award of the Society of Polymer Science, Japan

Research Interests:

Synthesis of Conformational Polymers and Supramolecules and Their Application for Catalysis, Photo-electronic Materials, Material Preparation Using Light

Selected Representative Publications:

1. Sakamoto, T.; Fukuda, Y.; Satoh, T.; Nakano, T. "Photoinduced Racemization of an Optically Active Helical Polymer Formed by the Asymmetric Polymerization of 2,7-Bis(4-*tert*-butylphenyl)fluoren-9-yl Acrylate" *Angew. Chem. Int. Ed.* **2009**, *48*, 9308-9311.
2. Pietropaolo, A.; Nakano, T. "Molecular Mechanism of Polyacrylate Helix Sense Switching Across Its Free Energy Landscape" *J. Am. Chem. Soc.* **2013**, *135*, 5509-5512.
3. Wang, Y.; Sakamoto, T.; Nakano, T. "Molecular Chirality Induction to an Achiral π-Conjugated Polymer by Circularly Polarized Light" *Chem. Comm.* **2012**, *48*, 1871-1873.
4. Pietropaolo, A.; Wang, Y.; Nakano, T. "Predicting the Switchable Screw Sense in Fluorene-Based Polymers" *Angew. Chem. Int. Ed.* **2015**, *54*, 2688–2692.
5. Wang, Y.; Kanibolotsky, A. L.; Skabara, P. J.; Nakano, T. "Chirality Induction Using Circularly Polarized Light into a Branched Oligofluorene Derivative in the Presence of an Achiral Aid Molecule" *Chem. Commun*. **2016**, *52*, 1919-1922.
6. Nakano, T.; Yade, T. "Synthesis, Structure, and Photophysical and Electrochemical Properties of a π-Stacked Polymer" *J. Am. Chem. Soc.* **2003**, *125*(50), 15474-15484.
7. Nakano, T.; Takewaki, K.; Yade, T.; Okamoto, Y. "Dibenzofulvene, a 1,1-Diphenylethylene Analogue, Gives a π-Stacked Polymer by Anionic, Free-Radical, and Cationic Catalysts" *J. Am. Chem. Soc.* **2001**, *123*(37), 9182-9183.

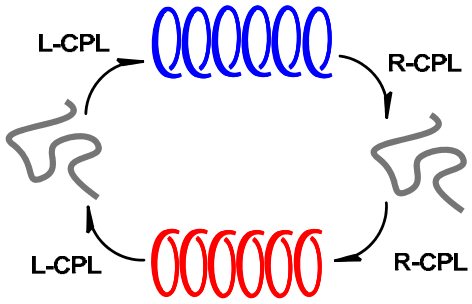
Chirality Induction to Polymers and Molecules Using Circularly Polarized Light

Tamaki Nakano

Macromolecular Science Research Division, Department of Fundamental Research,
Institute for Catalysis, Hokkaido University
N21W10, Kita-ku, Sapporo 001-0021, Japan
Email: tamaki.nakano@cat.hokudai.ac.jp

Optically active polymers are an important class of materials that find a wide range of applications in fields such as chiral recognition, nonlinear optics, and chiral catalysis. Among such polymers, those having a helical conformation with preferred handedness are especially of current interest. Such a conformation has been realized for various types of synthetic polymers including vinyl polymers, main-chain conjugated polymers and polymers containing hetero atoms in the main chain and can be constructed typically through asymmetric polymerization using a chiral ligand and through controlled supramolecular interactions between polymer chain and external molecule.[1]

We are recently focusing on devising a new class of optically active polymer preparation on the basis of chirality of light. Circularly polarized light (CPL) can be regarded as homochiral light and is obtained by modulation of non-polarized light. Our CPL-based methods of optically active polymer preparation are based on "enantiomer-selective excitation" of a group in polymer chain which exists as a racemic mixture in the ground state.



Enantiomer-selective excitation of such a group leads to an optically active form of a polymer chain rich in the antipodes that are not selectively excited (de-racemization process) if exchange between racemates is prohibited in the ground state and is possible only in excited states.

A series of work was initiated by the finding of photo racemization of a preferred-handed helical polyacrylate where side-chain biphenyl moiety in the polymer underwent "twist-coplanar transition" on photo excitation with non-polarized light.[2,3] This work was extended to CPL-driven helix formation of poly(9,9-di-*n*-octylfluorene-2,7-diyl) in a thin film form where 5/1-helix is reversibly formed by CPL irradiation.[4,5] In this method, interactions between chains and between chains and substrate for film formation play an important role. It has been hence difficult to induce chirality to an amorphous material which does not have significant inter-chain interactions. Recently, we found a method to overcome this point which uses achiral aid molecules to reinforce inter-chain interactions.[5]

References

1. Yashima, E.; Maeda, K.; Iida, H.; Furusho, Y.; Nagai, K. *Chem. Rev.* **2009**, *109*, 6102-6211..
2. Sakamoto, T.; Fukuda , Y.; Satoh, T.; Nakano, T. *Angew. Chem. Int. Ed.* **2009**, *48*, 9308-9311.
3. Pietropaolo, A.; Nakano, T. *J. Am. Chem. Soc.* **2013**, *135*, 5509–5512.
4. Wang, Y.; Sakamoto, T.; Nakano, T. *Chem. Comm.* **2012**, *48*, 1871 – 1873.
5. Pietropaolo, A.; Wang, Y.; Nakano, T. *Angew. Chem. Int. Ed.* **2015**, *54*, 2688–2692.
6. Wang, Y.; Kanibolotsky, A. L.; Skabara, P. J.; Nakano, T. *Chem. Commun.* **2016**, *52*, 1919 – 1922.

Curriculum Vitae

Name: **Christine Luscombe**

Date of Birth: December 18, 1977

Title: Robert J. Campbell Associate Professor

Affiliation: Materials Science and Engineering Department,
University of Washington,
Seattle, WA 98195-2120, USA

Telephone, Fax, E-mail, Website: TEL +1-206-616-1220, FAX +1-206-543-3100; luscombe@uw.edu; http://faculty.washington.edu/luscombe

Education: BA/MSci University of Cambridge, 2000
Ph.D. University of Cambridge, 2005
Postdoc UC Berkeley (Jean M. J. Fréchet), 2004-2006

Current Appointments:

University of Washington, Robert J. Campbell Associate Professor (2006 - present)
Journal of Materials Chemistry A, Associate Editor (2013 - present)
IUPAC Polymer Division, Vice President (2016 - present)

Recent Awards:

2015 Chemistry of Materials Reviewer Award
2015 Kavli Fellow
2013 Faculty of the Year Award
2012 Sigma Aldrich Lecturer
2010 Sloan Research Fellow

Research Interests:

- Synthesis and applications of π -conjugated semiconducting polymers for organic field effect transistors and organic photovoltaics
- Development of more environmentally benign methods to synthesize π-conjugated semiconducting polymers
- Study of living polymerization methods for the synthesis of π-conjugated semiconducting polymers

Selected Representative Publications:

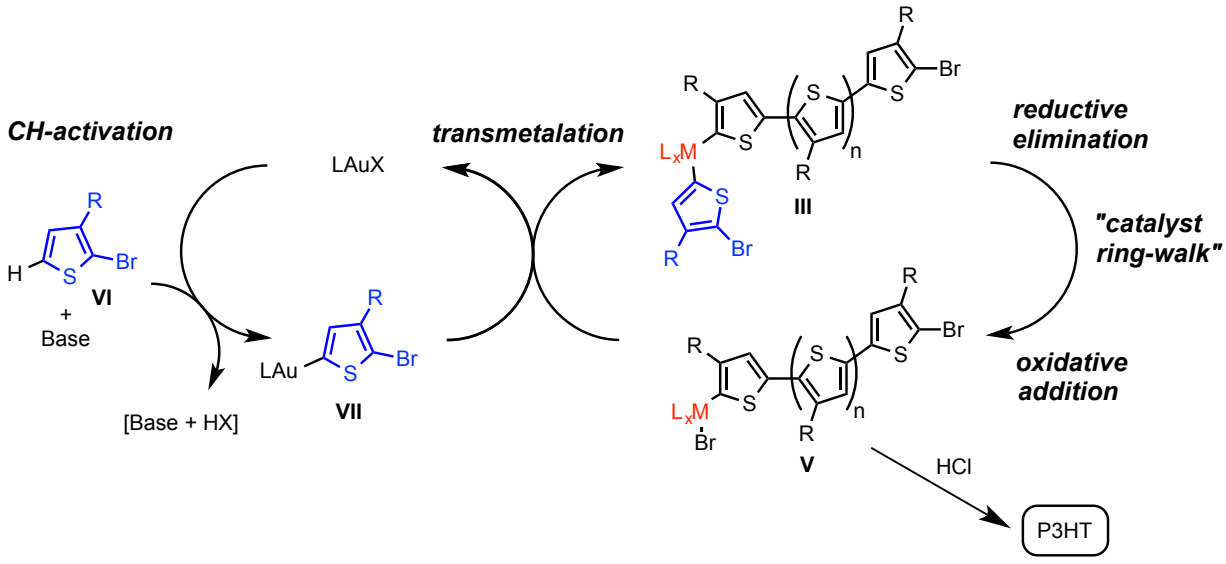
1. Suraru, S. L.; Lee, J. A.; Luscombe, C. K. "Preparation of an aurylated alkylthiophene monomer via C-H activation for use in Pd-PEPPSI-iPr catalyzed controlled chain growth polymerization" *ACS Macro Lett*., **2016**, *5*, 533.
2. Martin, T. R.; Katahara, J. K.; Bucherl, C. N.; Krueger, B. W.; Hillhouse, H. W.; Luscombe, C. K. "Nanoparticle ligands and pyrolized graphitic carbon in CZTSSe photovoltaic devices" *Chem. Mater.*, **2016**, *28*, 135.
3. Zeigler, D. F.; Candelaria, S. L.; Mazzio, K. A.; Martin, T. R.; Uchaker, E.; Suraru, S.-L.; Kang, L. J.; Cao, G.; Luscombe, C. K. "N-type hyperbranched polymers for supercapacitor cathodes with variable porosity and excellent electrochemical stability" *Macromolecules*, **2015**, *48*, 5196.
4. Martin, T. R.; Mazzio, K. A.; Hillhouse, H. W.; Luscombe, C. K. "Sulfur copolymer for the direct synthesis of ligand-free CdS nanoparticles" *Chem. Commun.*, **2015**, *51*, 11244.
5. Zeigler, D. F.; Mazzio, K. A.; Luscombe, C. K. "Fully Conjugated Graft Copolymers Comprising a P-type Donor-Acceptor Backbone and Poly(3-hexylthiophene) Sidechains Synthesized Via a "Graft Through" Approach"*Macromolecules*, **2014**, *47*, 5019.

Controlled synthesis of polymers and hybrid materials for optoelectronics applications

Christine Luscombe

Department of Materials Science and Engineering
University of Washington,
Seattle, WA 98195-2120, USA
Email: luscombe@uw.edu

Π-Conjugated polymers are being used in the fabrication of a wide variety of organic electronic devices such as organic field-effect transistors (OFETs), organic photovoltaic (OPV) devices, and organic light-emitting diodes (OLEDs). Since the seminal work on the conductivity of polyacetylene by Heeger, MacDiarmid, and Shirakawa was published in 1970s, the field of organic electronics has grown exponentially. The advances made in organic electronics have been driven by the syntheses of π-conjugated polymers with increasingly complex structures. Our group has been studying and developing techniques to grow semiconducting polymers using a living polymerization method.[1,2] This has allowed us to synthesize polymer architectures that we haven't been able to access till now including polythiophene brushes,[3] star-shaped P3HT,[4] as well as hyperbranched P3HT.[5] Our recent work related to this, as well as our work towards synthesizing hybrid materials will be discussed.



References

1. Bronstein, H. A.; Luscombe, C. K. "Externally initiated regioregular P3HT with controlled molecular weight and narrow polydispersity." *J. Am. Chem. Soc.*, **2009**, *131*, 12894.
2. Okamoto, K.; Luscombe, C. K. "Controlled polymerizations for the synthesis of semiconducting conjugated polymers" *Polym. Chem.*, **2011**, *2*, 2424.
3. Zeigler, D. F.; Mazzio, K. A.; Luscombe, C. K. "Fully Conjugated Graft Copolymers Comprising a P-type Donor-Acceptor Backbone and Poly(3-hexylthiophene) Sidechains Synthesized Via a "Graft Through" Approach" *Macromolecules*, **2014**, *47*, 5019.
4. Yuan, M. J.; Okamoto, K.; Bronstein, H. A.; Luscombe, C. K. "Constructing regioregular star poly(3-hexylthiophene) via externally initiated Kumada catalyst-transfer polycondensation" *ACS Macro Letters*, **2012**, *1*, 392.
5. Okamoto, K.; Housekeeper, J.; Michael, F. E.; Luscombe, C. K. "Thiophene based hyperbranched polymers with tunable branching using direct arylation methods" *Poly. Chem.*, **2013**, *4*, 3499.

Curriculum Vitae

Name: **SHUNSAKU KIMURA**

Date of Birth: February 20, 1954

Title: Professor

Affiliation: Kyoto University, Graduate School of Engineering, Department of Material Chemistry, Kyoto-Daigaku-Katsura, Nishikyo-ku, Kyoto 615-8510 Japan

Telephone, Fax, E-mail, Website:

TEL. +81-75-383-2400, FAX +81-75-383-2401, shun@scl.kyoto-u.ac.jp,
http://pixy.polym.kyoto-u.ac.jp/

Education: B.A. Kyoto University, 1976
Ph.D. Kyoto University, 1982
Postdoc ETH-Zurich, 1982

Current Appointments:
Kyoto University, Professor (1999 - present)
Associate Editor, *Polymer Journal* (June 2005 - present)

Recent Awards:
2008-2011 Translational Research Center, Kyoto University, Professor
1998 The Award of SPSJ

Research Interests:
Bio-related Chemistry, Molecular Electronics, Peptide Materials, Biomaterials

Selected Representative Publications:

1. H. Uji, T. Ito, M. Matsumoto, S. Kimura, Prevailing photocurrent generation of D-π-A type oligo(phenyleneethynylene) in contact with gold over dexter-type energy-transfer quenching, *J. Phys. Chem. A.*, **120(8)**, 1190-1196 (2016)
2. H. Uji, K. Tanaka, S. Kimura, O2-triggered directional switching of photocurrent in self-assemblied monolayer composed of porphyrin- and fullerene- terminated helical peptides on gold, *J. Phys. Chem. C.*, **120(7)**, 3684-3689 (2016)
3. A. Uesaka, I. Hara, T. Imai, J. Sugiyama, S. Kimura, Unsymmetric vesicles with a different design on each side for near-infrared fluorescence imaging of tumor tissues, *RSC Adv.*, **5(19)**, 14697-14703 (2015)
4. CJ. Kim, E. Hara, A Shimizu, M. Sugai, S. Kimura, Activation of b1a cells in peritoneal cavity by T cell-independent antigen expressed on polymeric micelle., *J Pharm Sci.*, **104(5)**, 1839-1847 (2015)
5. E. Hara, M. Ueda, A. Makino, I. Hara, E. Ozeki, S. Kimura, Factors influencing in vivo disposition of polymeric micelles on multiple administrations, *ACS Med. Chem. Lett.* , **5(8)**, 873-877 (2014)

Electron Mediating Properties of Nano-Architects with Peptide Scaffolds

Shunsaku Kimura

Department of Material Chemistry
Graduate School of Engineering, Kyoto University
Kyoto-Daigaku-Katsura, Nishikyo-ku, Kyoto 615-8510, Japan
Email: shun@scl.kyoto-u.ac.jp

Electron transfer reactions have been observed ubiquitously in biological systems comprising various biomolecules and biopolymers. The creation of devices with using the bio-related compounds is therefore a promising way to materialize molecular electronics. We have been studying the molecular systems composed of peptide molecules as an electron mediator and a scaffold for regular alignment of chromophores to scrutinize the electronic properties of the single molecule and molecular assemblies. For example, an extremely long-range over 10 nm electron transfer was shown by using a helical peptide, indicating that the mechanism of the electron transfer reaction is based on electron hopping via amide groups along the helical peptide.[1)] On the other hand, photo-current generation studies via peptides have not reported so many, even though the molecular system is attractive in light of the photo-energy conversion system. We have been studying photocurrent generation in peptide self-assembled monolayers (SAMs) having chromophores either at the molecular terminal and/or a linear array along the helical peptide. In the latter case, the electron transfer reaction occurred in accordance with the electron hopping mechanism with using the linearly-arranged chromophores as hopping sites.[2)] On the other hand, the electron tunnelling mechanism was found to be operating in the peptide SAMs having one chromophore at the molecular terminal.[3)] For example, the anodic photocurrent generation was observed with porphyrin-terminated hexadecapeptide immobilized on gold substrate vertically. The electron transfer reaction can be simulated by calculation based on the electron tunnelling mechanism. We report here in depth study describing the photocurrent generation in the helix-peptide self-assembled monolayers comprising porphyrin-terminated and fullerene-terminated peptides.

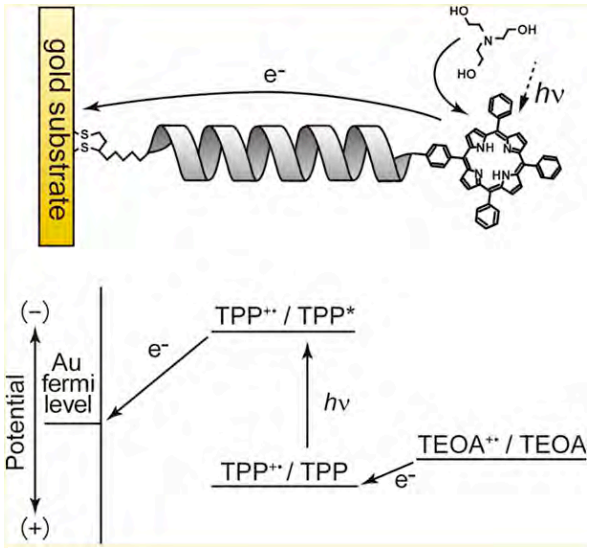


Figure 1. Schematic illustration of photocurrent generation by porphyrin-terminated hexadecapeptide immobilized on gold substrate (upper panel). Redox potential diagram for the photocurrent generation system (lower panel).

References

1) Arikuma, Y.; Nakayama, H.; Morita, T.; Kimura, S. *Angew. Chem. Int. Ed*. **2010**, 49, 1800-1804
2) Moritoh, R.; Morita, T.; Kimura, S. *Biopolymers* **2013**, 100, 1-13
3) Uji, H.; Yatsunami, Y.; Kimura, S. *J. Phys. Chem. C*, **2015**, 119, 8054-8061
4) Uji, H.; Tanaka, K.; Kimura, S. *J. Phys. Chem. C.*, **2016**, 120, 3684-3689

DAY THREE

(Sunday, June 26)

CURRICULA VITAE AND
ABSTRACTS

Curriculum Vitae

Name: **Virgil Percec**

Date of Birth: December 8, 1946

Title: P. Roy Vagelos Chair and Professor

Affiliation: Roy & Diana Vagelos Laboratories
Department of Chemistry
University of Pennsylvania
Philadelphia, PA 19104-6323, United States

Telephone, Fax, E-mail, Website: TEL 215-573-5527, FAX 215-573-7888
Percec@sas.upenn.edu; https://sites.sas.upenn.edu/percec/

Education:
B.A. Polytechnic University, Iasi, 1969
Ph.D. Institute of Macromolecular Chemistry, Iasi, 1976
Postdoc University of Freiburg (H.-J. Cantow), 1981 and University of Akron (J.P. Kennedy), 1981-1982

Current Appointments:

University of Pennsylvania, P. Roy Vagelos Chair and Professor (1999 - present)
Honorary Professor of the Australian Institute for Bioengineering & Nanoscience, University of Queensland, Brisbane, Australia (2012 - present)

Recent Awards:

2016 Doctor Honoris Causa, Polytechnic University, Bucharest
2015 Elected as "One of the Most Influential Minds of Our Time" by Thomson Reuters
2014 "Petru Poni" Medal of the Romanian Chemical Society
2013 Foreign Member to the Royal Swedish Academy of Engineering Science IVA
2011 The Inaugural ACS Award and Lecture Kavli Foundation Innovation in Chemistry
2011 Humboldt Award for Senior US Scientists

Research Interests:

New Synthetic Methods for Organic, Polymer and Supramolecular Chemistry; Supramolecular Chirality; Synthetic Biology; Complex Molecular Systems; Catalysis; Living Polymerizations; Stereoisomers

Selected Representative Publications:

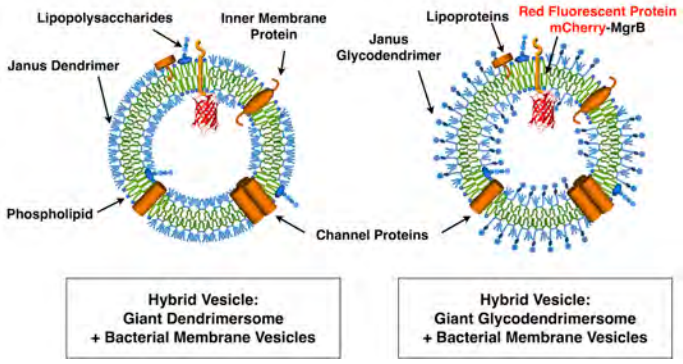
1. Roche, C.; Sun, H.J.; Leowanawat, P.; Araoka, F.; Partridge, B.E.; Peterca, M.; Wilson, D.A.; Prendergast, M.E.; Heiney, P.A.; Graf, R.; Spiess, H.W.; Zeng, X.B.; Ungar, G.; Percec, V. " A Supramolecular Helix that Disregards Chirality." *Nature Chem.* **2016**, *8*, 80–89.
2. Jezorek, R.L.; Zhang, N.; Leowanawat, P.; Bunner, M.H.; Gutsche, N.; Pesti, AS.K.R.; Olsen, J.T.; Percec, V. "Air-Stable Nickel Prtecatalysts for Fast and Quantitative Cross-Coupling of Aryl Sulfamates with Aryl Neopentylglycolboronates at Room Temperature." *Org. Lett.* **2014**, *16*, 6326–6329.
3. Percec, V.; Wilson, D. A; Leowanawat, P.; Wilson, C. J.; Hughes, A. D.; Kaucher, M. S.; Hammer, D. A; Levine, D. H.; Kim, A. J.; Bates, F. S.; Davis, K. P.; Lodge, T. P.; Klein, M. L.; DeVane, R. H.; Aqad, E.; Rosen, B. M.; Argintaru, A. O.; Sienkowska, M. J.; Rissanen, K.; Nummelin, S.; Ropponen, J. "Self-Assembly of Janus Dendrimers into Uniform Dendrimersomes and Other Complex Architectures." *Science* **2010**, *328*, 1009–1014.
4. Percec, V.; Dulcey, A.E.; Balagurusamy, V.S.K.; Miura, Y.; Smidrkal, J.; Peterca, M.; Nummelin, S.; Edlund, U.; Hudson, S.D.; Heiney, P.A.; Duan, H.; Magonov, S.N.; Vinogradov, S.A. "Self-Assembly of Dendritic Dipeptides into Helical Pores." *Nature* **2004**, *430*, 764-768.
5. Percec, V.; Ahn, C.-H.; Ungar, G.; Yeardley, D.P.J.; Moeller, M.; Sheiko, S.S. "Controlling Polymer Shape through the Self-Assembly of Dendritic Side Groups." *Nature* **1998**, *391*, 161-164.

Cell-Like Assemblies from Sequence-Defined Janus Glycodendrimers and Natural Cells

Virgil Percec

Roy & Diana Vagelos Laboratories, Department of Chemistry, University of Pennsylvania, Philadelphia, PA 19104-6323, USA
Email: Percec@sas.upenn.edu

Amphiphilic Janus dendrimers (1) and sequence-defined Janus glycodendrimers (2a-f) have been shown to co-assemble *in vitro* with natural cells to generate hybrid cell-like assemblies containing most of the machinery of the natural cells and an identical or a reprogrammed glycan (2). This general concept may enable new medical applications.



References:

(1) (a) Percec, V.; Wilson, D. A; Leowanawat, P.; Wilson, C. J.; Hughes, A. D.; Kaucher, M. S.; Hammer, D. A; Levine, D. H.; Kim, A. J.; Bates, F. S.; Davis, K. P.; Lodge, T. P.; Klein, M. L.; DeVane, R. H.; Aqad, E.; Rosen, B. M.; Argintaru, A. O.; Sienkowska, M. J.; Rissanen, K.; Nummelin, S.; Ropponen, J. *Science* **2010**, *328*, 1009–1014; (b) Zhang, S.; Sun, H.-J.; Hughes, A. D.; Moussodia, R.-O.; Bertin, A.; Chen, Y.; Pochan, D. J.; Heiney, P. A; Klein, M. L.; Percec, V. *Proc. Natl Acad. Sci. USA* **2014**, *111*, 9058–9606. C&EN **2014**, *92* (25), p. 29 (June 23, 2014);

(2) (a) Percec, V.; Leowanawat, P.; Sun, H.-J.; Kulikov, O.; Nusbaum, C. D.; Tran, T. M.; Bertin, A.; Wilson, D. A; Peterca, M.; Zhang, S.; Kamat, N. P.; Vargo, K.; Moock, D.; Johnston, E. D.; Hammer, D. A; Pochan, D. J.; Chen, Y.; Chabre, Y. M.; Shiao, T. C.; Bergeron-Brlek, M.; André, S.; Roy, R.; Gabius, H.-J.; Heiney, P. A. *J. Am. Chem. Soc.* **2013**, *135*, 9055–9077; (b) Zhang, S.; Moussodia, R. O.; Sun, H. J.; Leowanawat, P.; Muncan, A.; Nusbaum, C. D.; Chelling, K. M.; Heiney, P. A.; Klein, M. L.; André, S.; Roy, R.; Gabius, H. J.; Percec, V. *Angew. Chem. Int. Ed.* **2014**, *53*, 10899–10903; (c) Zhang, S.; Moussodia, R.-O.; Murzeau, C.; Sun, H.-J.; Klein, M. L.; Vértesy, S.; André, S.; Roy, R.; Gabius, H.-J.; Percec, V. *Angew. Chem. Int. Ed.* **2015**, *54*, 4036–4040; (d) Zhang, S.; Moussodia, R.-O.; Vértesy, S.; André, S.; Klein, M. L.; Gabius, H.-J.; Percec, V. *Proc. Natl Acad. Sci. USA* **2015**, *112*, 5585–5590; (e) Zhang, S.; Xiao, Q.; Sherman,. S.E.; Muncan, A.; Vicente, A.D.M.R.; Wang, Z.; Hammer, D.A.; Williams, D.; Chen. Y.; Pochan, D.J.; Vértesy, S.; André, S.; Klein, M. L.; Gabius, H.-J.; Percec, V. *J. Am. Chem. Soc*. **2015**, *137*, 13334-13344; (f) Xiao, Q.; Zhang, S.; Wang, Z.; Sherman,. S.E.; Moussodia, R.-O.; Peterca, M.; Muncan, A.; Williams, D.R.; Hammer, D.A.; Vértesy, S.; André, S.; Gabius, H.-J.; Klein, M. L.; Percec, V. *Proc. Natl Acad. Sci. USA* **2016**, *113*, 1162–1167; (g) Xiao, Q.; Yadavalli, S.S.; Zhang, S.; Sherman, S.E.; Fiorin, E.; da Silva, L.; Wilson, D.A.; Hammer, D.A.; André, S.; Gabius, H.-J.; Klein, M. L.; Goulian, M.; Percec, V. *Proc. Natl Acad. Sci. USA* **2016**, *113*, E1134-E1141.

Curriculum Vitae of Dr. Takuzo AIDA

Affiliation:
Department of Chemistry and Biotechnology, School of Engineering, The University of Tokyo, 7-3-1 Hongo, Bunkyo-ku, Tokyo 113-8656, Japan.

Education:
BS: Faculty of Engineering, Yokohama National University (1979)
MS: School of Engineering, The University of Tokyo (1981)
PhD: School of Engineering, The University of Tokyo (1984)

Professional Appointments:
1984–1989: Assistant Professor, The University of Tokyo
1989–1991: Lecturer, The University of Tokyo
1991–1996: Associate Professor, The University of Tokyo
1996–Now: Professor, The University of Tokyo

1996–1999: Researcher, Japan Science & Technology Agency, PRESTO Project
2000–2005: Director, Japan Science & Technology Agency, ERATO Nanospace Project
2005–2010: Director, Japan Science & Technology Agency, EARTO–SORST Project on Electronic Nanospace
2008–2012: Director, RIKEN Advanced Science Institute
2013–2013 Deputy Director, Riken Center for Emergent Matter Science
2004–2006: Associate Editor, *Journal of Materials Chemistry* (RSC)
2009– Board of Reviewing Editors, *Science Magazine* (AAAS)
2014– Advisory Board, *Journal of the American Chemical Society* (ACS)

Recent Awards:
American Chemical Society Award in Polymer Chemistry (**2009**) / Chemical Society of Japan Award (**2009**) / Purple Ribbon (**2010**) / Alexander von Humboldt Research Award (**2011**) / Fujiwara Prize (**2011**) / Honorary Fellowship of the Chemical Research of India (**2013**) / Arthur K. Doolittle Award (American Chemical Society, PMSE Division) (**2013**) / Van 't Hoff Award Lecture 2013 (**2013**) / Leo Esaki Prize (**2015**) / Dean Award, U. Tokyo (**2016**)

Selected Publications:
(1) Boronic Acid-Appended Molecular Glues for ATP-Responsive Activity Modulation of Enzymes
J. Am. Chem. Soc. **2016**, in press (**DOI:** 10.1021/jacs.6b02664).
(2) Thermoresponsive Actuation Enabled by Permittivity Switching in an Electrostatically Anisotropic Hydrogel
Nature Mat. **2015**, *14*, 1002–1007.
(3) Ultrahigh-throughput Exfoliation of Graphite into Pristine 'Single-Layer' Graphene Using Microwaves and Molecularly Engineered Ionic Liquids
Nature Chem. **2015**, *7*, 730–736.
(4) Sub-Nanoscale Hydrophobic Modulation of Salt Bridges in Aqueous Media
Science **2015**, *348*, 555–559.
(5) Selective-Assemblies of Giant Tetrahedra via Precisely Controlled Positional Interactions
Science **2015**, *348*, 424–428.
(6) A Rational Strategy for the Realization of 'Chain-Growth' Supramolecular Polymerization
Science **2015**, *347*, 646–651.
(7) Supramolecular Ferroelectrics
Nature Chem. **2015**, *7*, 281–194.
(8) Anisotropic Hydrogel with Embedded Electrostatic Repulsion among Cofacially Oriented 2D Electrolytes
Nature **2015**, *517*, 68–72.

Rational Strategy for Chain-Growth Supramolecular Polymerization

Takuzo Aida [1, 2]

[1.] Department of Chemistry and Biotechnology, School of Engineering, The University of Tokyo

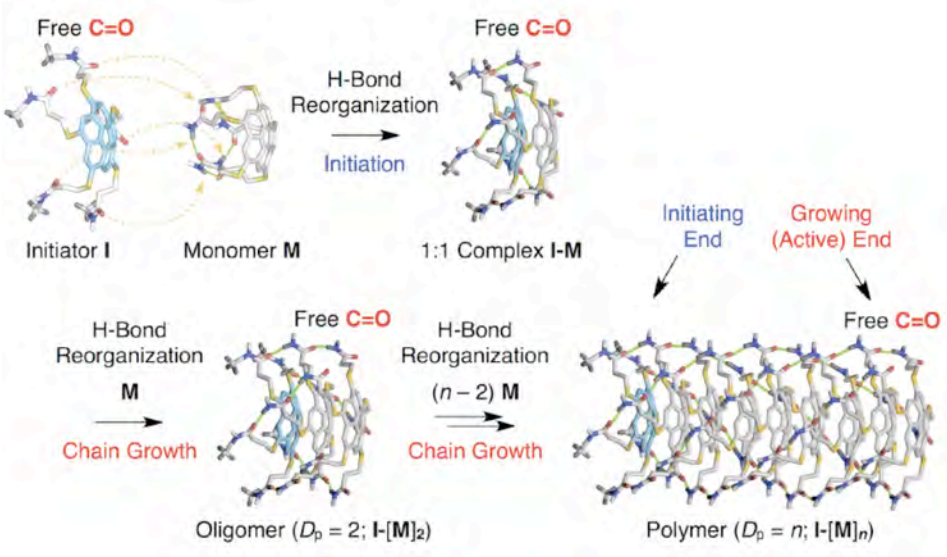
[2.] Riken Center for Emergent Matter Science

E-mail: aida@macro.t.u-tokyo.ac.jp

We have developed the first rational strategy for 'chain-growth' supramolecular polymerization composed of defined initiation and propagation steps, featuring 'metastable' bowl-shaped monomers that are designed to polymerize at ambient temperatures only when mixed with tailored initiators, and succeeded in forming noncovalent polymers with a uniform and desired chain length in a precise stereoselective manner. Over the last decade, significant progress in supramolecular polymerization, initiated by Lehn and Meijer and their coworkers has had a substantial impact on the design of functional soft materials.[1,2] However, despite recent advances for obtaining polymers with narrow PDI, most studies are still based on a preconceived notion that supramolecular polymerization follows the step-growth mechanism, which precludes control over chain-length, sequence, and stereochemical structure. Here we report the realization of chain-growth polymerization by designing metastable monomers with a shape-promoted intramolecular hydrogen-bonding network.[3] The monomers are conformationally restricted from spontaneous polymerization at ambient temperatures, but begin to polymerize with characteristics typical of a living mechanism upon mixing with tailored initiators. The chain growth occurs stereoselectively and therefore enables optical resolution of a racemic monomer.

References

(1) J. -M. Lehn, *Macromol. Chem. Macromol. Symp.* **1993**, *69*, 1. (2) E. W. Meijer *et al.*, *Science* **1997**, *278*, 1601. (3) Kang and Miyajima *et al.*, *Science* **2015**, *347*, 646.



Curriculum Vitae

Name: **BRENT S. SUMERLIN**

Date of Birth: May 10, 1976

Title: Professor

Affiliation: University of Florida
Department of Chemistry
Gainesville, FL 32611-7200

Telephone, Fax, E-mail, Website: TEL +1-352-392-0563, FAX +1-392-352-9741
http://www.chem.ufl.edu/~sumerlin/

Education:

B.S.	North Carolina State University, 1998
Ph.D.	University of Southern Mississippi, 2003
Postdoc	Carnegie Mellon University (Krzysztof Matyjaszewski), 2003 - 2005

Current Appointments:

University of Florida, Professor of Chemistry (2015 - present)
University of Florida, UF Diabetes Institute, Affiliate Faculty Member (2016 - present)

Recent Awards:

2015 ACS Biomacromolecules/Macromolecules Young Investigator Award
2015 PAT2015 Outstanding Junior Scientist Award
2015 Journal of Polymer Science Innovation Award
2013 Fellow, Royal Society of Chemistry
2010 Alfred P. Sloan Research Fellow

Research Interests:

Identification, synthesis, and characterization of polymers with selected functionality, composition, and molecular architecture. Several areas of polymer chemistry are being investigated, with particular focus on those most closely related to biological applications.

Selected Representative Publications:

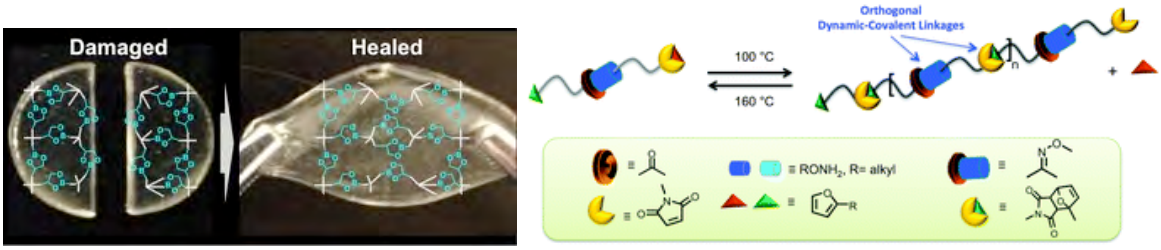
1. Stella Gonsales, Tomohiro Kubo, Madison Flint, Khalil Abboud, Brent S. Sumerlin, Adam S. Veige "Highly Tactic Cyclic Polynorbornene: Stereoselective Ring Expansion Metathesis Polymerization (REMP) of Norbornene Catalyzed By a New Tethered Tungsten-alkylidene Catalyst" *Journal of the American Chemical Society* **2016**, in press.
2. William L. A. Brooks, Brent S. Sumerlin "Synthesis and Applications of Boronic Acid-Containing Polymers: From Materials to Medicine" *Chemical Reviews* **2016**, *116*, 1375-1397.
3. Tomohiro Kubo, C. Adrian Figg, Jeremy L. Swartz, William L. A. Brooks, Brent S. Sumerlin "Multifunctional Homopolymers: Post-Polymerization Modification via Sequential Nucleophilic Aromatic Substitution" *Macromolecules* **2016**, *49*, 2077-2084.
4. Jawaher A. Alfurhood, Hao Sun, Patricia R. Bachler, Brent S. Sumerlin "Hyperbranched Poly(N-(2-Hydroxypropyl) Methacrylamide) via RAFT Self-Condensing Vinyl Polymerization" *Polymer Chemistry* **2016**, *7*, 2099-2104.
5. Soma Mukherjee, William L. A. Brooks, Yuqiong Dai, Brent S. Sumerlin "Doubly-Dynamic-Covalent Polymers Composed of Oxime and Oxanorbornene Links" *Polymer Chemistry* **2016**, *7*, 1971-1978.

SYNTHESIS AND INVESTIGATION OF STIMULI-RESPONSIVE POLYMERS CAPABLE OF STRUCTURALLY DYNAMIC ASSEMBLY

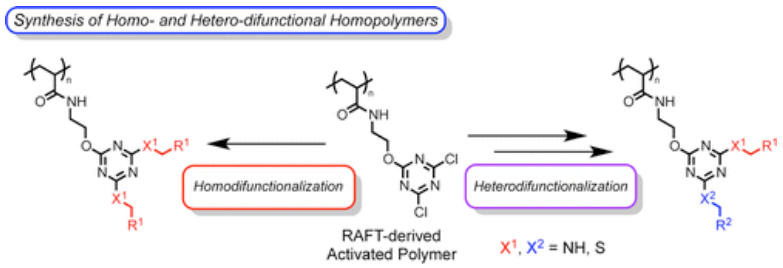
Brent S. Sumerlin

George & Josephine Butler Polymer Research Laboratory
Center for Macromolecular Science & Engineering
Department of Chemistry
University of Florida
Gainesville, Florida, USA
Email: sumerlin@chem.ufl.edu

By relying on a variety of reversible covalent reactions that lead to readily cleaved bonds, we have prepared materials that combine the physical integrity of covalent materials and the structural dynamics of supramolecular complexes. Oximes, boronic esters, boronate esters, and Diels-Alder linkages have all been employed to prepare these responsive and dynamic materials, with particular attention having been dedicated to the preparation of hydrogels, elastomers, and nanoparticles. We seek to exploit the reversible nature of these bonds to prepare responsive and self-healing materials.



A variety of new synthetic methods have been developed to access these dynamic-covalent materials. We have demonstrated that dual functionalization of polymer end groups and monomer units can be effected via the remarkable chemoselectivity of 2,4,6-trichloro-1,3,5-triazine (TCT). Moreover, many of the materials we investigate rely on block copolymer self-assembly in the bulk or in solution. To facilitate access to these materials, we have developed new routes for the synthesis of block copolymers via reversible-deactivation radical polymerization in a one-pot closed-system process.



Curriculum Vitae

Name: **Daisuke TAKEUCHI**

Date of Birth: January 11, 1972

Title: Associate Professor

Affiliation: Tokyo Institute of Technology, Institute of Innovative Research, Laboratory for Chemistry and Life Science
4259 Nagatsuda, Yokohama 226-8503, Japan

Telephone, Fax, E-mail, Website: TEL +81-45-924-5231, FAX +81-45-924-5224
dtakeuch@res.titech.ac.jp; http://www.res.titech.ac.jp/~shinkin/

Education:
B.Eng. The University of Tokyo, 1994
M.Eng. The University of Tokyo, 1996
Ph.D. Tokyo Institute of Technology, 2000

Current Appointments:
Tokyo Institute of Technology, Associate Professor (2006 - present)

Recent Awards:
2016 Kanto Society for Engineering Education Award
2013 Bridgestone Soft Materials Frontier Award
2010 SPSJ Wiley Award

Research Interests:
Controlled Synthesis of Polymers with Novel Structures, and Polymerization Catalyzed by Dinuclear Catalysts

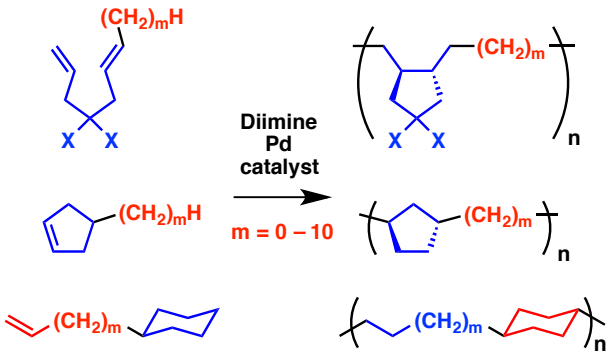
Selected Representative Publications:
1. Jouffroy, M.; Armspach, D.; Matt, D.; Osakada, K.; Takeuchi, D. "Synthesis of Optically Active Polystyrene using Monophosphine Pd Complexes" *Angew. Chem. Int. Ed.*, **2016**, *55*, *in press* (DOI: 10.1002/anie.201603191).
2. Takano, S.; Takeuchi, D.; Osakada, K. "Olefin Polymerization Catalyzed by Double-Decker Dipalladium Complexes: Low Branched Poly(α-Olefin)s by Selective Insertion of the Monomer Molecule" *Chem. Eur. J.,* **2015**, *21*, 16209-16218.
3. Takeuchi, D.; Watanabe, K.; Osakada, K. "Synthesis of Polyketones Containing Substituted Six-Membered Rings via Pd-Catalyzed Copolymerization of Methylenecyclohexanes with Carbon Monoxide" *Macromolecules,* **2015**, *48*, 6745-6749.
4. Takano, S.; Takeuchi, D.; Osakada, K.; Akamatsu, N.; Shishido, A. "Dipalladium Catalyst for Olefin Polymerization: Introduction of Acrylate Units into the Main Chain of Branched Polyethylene" *Angew. Chem., Int. Ed.,* **2014**, *53*, 9246-9250.
5. Motokuni, K.; Takeuchi, D.; Osakada, K. "Double Cyclopolymerization of Monoterminal Trienes Using Pd Catalysis. Polymers Containing Functionalized Cyclic Groups with a Regulated Sequence", *Macromolecules,* **2014**, *47*, 6522-6526.
6. Takeuchi, D.; Chiba, Y.; Takano, S.; Osakada, K. "Double-Decker-Type Dinuclear Nickel Catalyst for Olefin Polymerization: Efficient Incorporation of Functional Co-monomers" *Angew. Chem. Int. Ed.,* **2013**, *52*, 12536-12540.
7. Takeuchi, D. "Precise Isomerization Polymerization of Alkenylcyclohexanes: Stereoregular Polymers Containing Six-Membered Rings along the Polymer Chain" *J. Am. Chem. Soc.,* **2011**, *133*, 11106-11109.

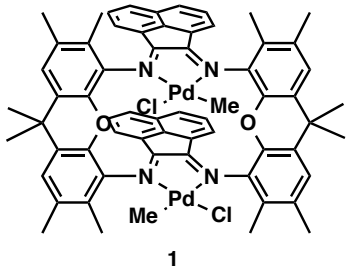
Synthesis of New Polyolefins by Rational Design of Monomers and Catalysts

Daisuke Takeuchi

Laboratory for Chemistry and Life Science
Institute of Innovative Research, Tokyo Institute of Technology
4259 Nagatsuda, Yokohama 226-8503, Japan
Email: dtakeuch@res.titech.ac.jp

Diimine Pd complexes promote polymerization of ethylene and α-olefins to give polymers with various branched structures.[1] Copolymerization of ethylene with acrylate by the catalysts affords branched polymer with the acrylate units on the terminal of the branches.[2] Herein we report olefin polymerization by the diimine Pd catalysts to give regulated repeating structure, and dipalladium complexes for olefin polymerization. Diimine Pd complexes promote isomerization polymerization of non-conjugated dienes[3] and trienes[4], alkylcyclopentenes[5], and alkenylcyclohexanes[6] to produce polymers composed of alternating cycloalkylene units and oligomethylene spacers. The density and distribution of the cycloalkylene units in the polymer can be controlled by changing the oligomethylene spacer of the monomers. The stereochemistry of the cycloalkylene units is well-regulated. Diimine Pd complexes are also effective for polymerization of *tert*-butylethylene and methylenecyclohexanes[7], in spite of their general low reactivity. XRD analysis of poly(*tert*-butylethylene) revealed its helical structure. Double-decker type dinuclear Pd complexes such as **1** promote polymerization of α-olefins to afford polymers with much less branched structure than those obtained by the mononuclear analogue.[8] The dipalladium complexes are also effective for ethylene-acrylate copolymerization and the produced branched copolymers contain the acrylate units on the main chain rather than at the terminal of the braches.[9]





References

1. Johnson, L. K.; Killian, C. M.; Brookhart, M. *J. Am. Chem. Soc.,* **1995**, *117*, 6414-6415.
2. Johnson, L. K.; Mecking, S.; Brookhart, M. *J. Am. Chem. Soc.,* **1996**, *118*, 267-268.
3. Okada, T.; Park, S.; Takeuchi, D.; Osakada, K. *Angew. Chem. Int. Ed.,* **2007**, *46*, 6141-6143.
4. Motokuni, K.; Takeuchi, D.; Osakada, K. *Polym. Chem.,* **2015**, *6*, 1248-1254.
5. Okada, T.; Takeuchi, D.; Shishido, A.; Ikeda, T.; Osakada, K. *J. Am. Chem. Soc.,* **2009**, *131*, 10852-10853.
6. Takeuchi, D. *J. Am. Chem. Soc.,* **2011**, *133*, 11106-11109.
7. Takeuchi, D.; Watanabe, K.; Sogo, K.; Osakada, K. *Organometallics,* **2015**, *34*, 3007-3011.
8. Takano, S.; Takeuchi, D.; Osakada, K. *Chem. Eur. J.*, **2015**, *21*, 16209-16218.
9. Takano, S.; Takeuchi, D.; Osakada, K.; Akamatsu, N.; Shishido, A. *Angew. Chem., Int. Ed.*, **2014**, *53*, 9246-9250.

Curriculum Vitae

Name: **Robert Howard Grubbs**

Title: Victor and Elizabeth Atkins Professor of Chemistry

Affiliation: California Institute of Technology
Division of Chemistry and Chemical Engineering, MC 164-30
1200 E. California Blvd, Pasadena, CA 91125 USA

Telephone, E-mail, Website: TEL 01 626 395 6003
rhg@caltech.edu; http://www.caltech.edu/~chemistry/Faculties/Grubbs.html

Education:

B.S.	University of Florida, Gainesville, Florida, 1963
M.S.	University of Florida, Gainesville, Florida, 1965
Ph.D.	Columbia University, New York, NY, 1968
Postdoc	Stanford University, Stanford, CA 1968-1969

Current Appointments:

California Institute of Technology (Atkins Professor – 1990 to present)

Selected Recent Awards:

2015	Foreign Membership of Chinese Academy of Sciences
2015	National Academy of Engineering of the National Academies
2014	Fellow of National Academy of Inventors (FNAI)
2014	Giulio Natta Award 2014 for Chemistry
2005	Nobel Prize in Chemistry for 2005, Royal Swedish Academy of Sciences

Research Interests:

The Grubbs' group discovers new catalysts and studies their fundamental chemistry and applications.

Selected Representative Publications:

"ABA Triblock Brush Polymers: Synthesis, Self-Assembly, Conductivity, and Rheological Properties." C. M. Bates, A. B. Chang, N. Momcilovic, S. C. Jones, R. H. Grubbs, *Macromolecules* **2015**, *48 (14)*, 4967-4973. doi: 10.1021/acs.macromol.5b00880

"The Linear Rheological Responses of Wedge-Type Polymers." M. Hu, Y Xia, C.S. Daeffler, J. H. Wang, G. B. McKenna, J. A. Kornfield, R. H. Grubbs, *J. Polym. Sci. Part B* **2015**, *53 (13)*, 899-906. doi: 10.1002/polb.23716

"Probing Stereoselectivity in Ring-Opening Metathesis Polymerization Mediated by Cyclometalated Ruthenium-Based Catalysts: A Combined Experimental and Computational Study." L. E. Rosebrugh, T. S. Ahmed, V. M. Marx, J. Hartung, P. Liu, J. G. Lopez, K. N. Houk, R. H. Grubbs, *J. Am. Chem. Soc.* **2016**, *138 (4),* 1394-1405. doi: 10.1021/jacs.5b12277

Synthesis of Polymers Utilizing ROMP

Robert Howard Grubbs

Victor and Elizabeth Atkins Professor of Chemistry
Division of Chemistry and Chemical Engineering, MC 164-30
California Institute of Technology, 1200 E. California Blvd
Pasadena, CA 91125 USA
Email: rhg@caltech.edu

Ring opening metathesis polymerization (ROMP) provides a method for the controlled synthesis of polymers with selected structures. By the design of appropriate ligands on the complex, the stereochemistry of the double bonds produced in ring opening can be controlled to by very high *cis*. In addition, many of these same catalysts will control the tacticity through site control. Since the sites of activity in these systems are enantiotopic, the resulting polymers are syndiotactic. The catalysts also serve as initiators for living polymerization. Through the use of macromers, brush polymers can be prepared. The use of different monomers allows for the synthesis of brush-lock polymers that have been found to phase separate into well ordered morphologies with length scales of 100s of nanometers. TEM and SAXS have been used to fully characterize the morphologies over a wide range of compositions.

References

"ABA Triblock Brush Polymers: Synthesis, Self-Assembly, Conductivity, and Rheological Properties." C. M. Bates, A. B. Chang, N. Momcilovic, S. C. Jones, R. H. Grubbs, *Macromolecules* **2015**, *48 (14)*, 4967-4973. doi: 10.1021/acs.macromol.5b00880

"The Linear Rheological Responses of Wedge-Type Polymers." M. Hu, Y Xia, C.S. Daeffler, J. H. Wang, G. B. McKenna, J. A. Kornfield, R. H. Grubbs, *J. Polym. Sci. Part B* **2015**, *53 (13)*, 899-906. doi: 10.1002/polb.23716

"Probing Stereoselectivity in Ring-Opening Metathesis Polymerization Mediated by Cyclometalated Ruthenium-Based Catalysts: A Combined Experimental and Computational Study." L. E. Rosebrugh, T. S. Ahmed, V. M. Marx, J. Hartung, P. Liu, J. G. Lopez, K. N. Houk, R. H. Grubbs, *J. Am. Chem. Soc.* **2016**, *138 (4),* 1394-1405. doi: 10.1021/jacs.5b12277

Curriculum Vitae

Name: **TOSHIFUMI SATOH**

Date of Birth: September 10, 1968

Title: Professor

Affiliation: Hokkaido University, Faculty of Engineering,
Division of Applied Chemistry,
Kita-ku, Sapporo 060-8628, Japan

Telephone, Fax, E-mail, Website: TEL +81-11-706-6602, FAX +81-11-706-6602
satoh@eng.hokudai.ac.jp; http://poly-bm.eng.hokudai.ac.jp/mol_e/index.html

Education:

B.A.	Hokkaido University, 1992
Ph.D.	Hokkaido University, 1996
Postdoc	University of Massachusetts at Amherst (Bruce M. Novak), 1998 – 1999
	North Carolina State University (Bruce M. Novak), 1999 - 2000

Current Appointments:

Hokkaido University, Professor (2013 - present)
Graduate School of Chemical Sciences and Engineering, Vice Dean, (2016 - present)

Recent Awards:

2015 Hokkaido University President's Award for Outstanding Research
2013 The Society of Polymer Science, Japan SPSJ Asahi Kasei Award 2013
2005 The Award for Encouraging Prize from Hokkaido Branch of the Chemical Society of Japan

Research Interests:

Development of controlled/living polymerization system and preparation of architecturally complex macromolecules, unimolecular micelles, and microphase-separated structures.

Selected Representative Publications:

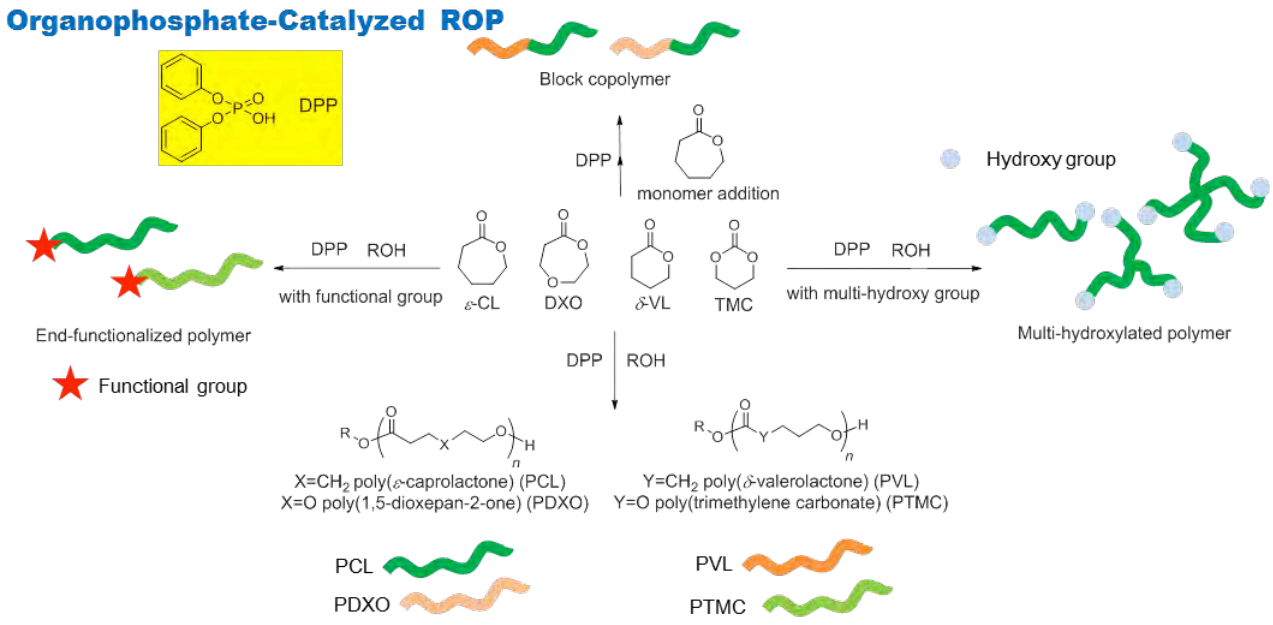
1. Wang, J.-T., Takashima, S., Wu, H.-C., Chiu, Y.-C., Chen, Y., Isono, T., Kakuchi, T., Satoh, T., Chen, W.-C., Donor-Acceptor Poly(3-hexylthiophene)-block-Pendent Poly(isoindigo) with Dual Roles of Charge Transporting and Storage Layer for High-Performance Transistor-Type Memory Applications, *Adv. Funct. Mater.*, **2016**, 10.1002/adfm.201504957
2. Satoh, Y., Miyachi, K., Matsuno, H., Isono, T., Tajima, K., Kakuchi, T., Satoh, T., Synthesis of Well-Defined Amphiphilic Star-Block and Miktoarm Star Copolyethers via t-Bu-P_4-Catalyzed Ring-Opening Polymerization of Glycidyl Ethers, *Macromolecules*, **2016**, 49, 499-509.
3. Isono, T., Asai, S., Satoh, Y., Takaoka, T., Tajima, K., Kakuchi, T., Satoh, T., Controlled/Living Ring-Opening Polymerization of Glycidylamine Derivatives Using *t*-Bu-P_4/Alcohol Initiating System Leading to Polyethers with Pendant Primary, Secondary, and Tertiary Amino Groups, *Macromolecules*, **2015**, 48, 3217-3229.
4. Makiguchi, K., Yamanaka, T., Kakuchi, T., Terada, M., Satoh, T., Binaphthol-derived phosphoric acids as efficient chiral organocatalysts for the enantiomer-selective polymerization of *rac*-lactide, *Chem. Commun.*, **2014**, 50, 2883-2885.
5. Kwon, W., Rho, Y., Kamoshida, K., Kwon, K. H., Jeong, Y. C., Kim, J., Misaka, H., Shin, T. J., Kim, J., Kim, K.-W., Jin, K. S., Chang, T., Kim, H., Satoh, T., Kakuchi, T., Ree, M., Well-Defined Functional Linear Aliphatic Diblock Copolyethers: A Versatile Linear Aliphatic Polyether Platform for Selective Functionalizations and Various Nanostructures, *Adv. Funct. Mater.*, **2012**, 22, 5194-5208.

Organophosphate-Catalyzed Ring-Opening Polymerization

Toshifumi Satoh

Division of Applied Chemistry
Faculty of Engineering, Hokkaido University
Kita-ku, Sapporo 060-8628, Japan
Email: satoh@eng.hokudai.ac.jp

The cationic ring-opening polymerizations of cyclic etsters and cyclic carbonates such as ε-caprolactone (ε-CL), δ-valerolactone (δ-VL), 1,5-dioxepan-2-one (DXO), and trimethylene carbonate (TMC) were carried out using diphenyl phosphate (DPP) as an organocatalyst, as shown in Scheme. All polymerizations proceeded with high monomer conversion and the obtained polymers had a predicted molecular weight with a very narrow dispersity. A postpolymerization succeeded with maintaining a narrow dispersity, which indicated that the polymerization proceeded in a living/controlled nature. In addition, various functional initiators could be utilized for syntheses of end-functionalized polymers. In conclusion, controlled/living polymerizations of cyclic monomers were achieved using organophosphate as an efficient organocatalyst.



References

1. Makiguchi, K., Satoh, T., Kakuchi, T., *Macromolecules*, **2011**, 44, 1999-2005.
2. Makiguchi, K., Ogasawara, Y., Kikuchi, S., Satoh, T., Kakuchi, T., **2013**, *Macromolecules*, 46, 1772-1782.
3. Otsuka, I., Isono, T., Rochas, C., Halila, S., Fort, S., Satoh, T., Kakuchi, T., Borsali, R., ACS *Macro Lett.*, **2012**, 1, 1379-1382.
4. Isono, T., Otsuka, I., Kondo, Y., Halila, S., Fort, S., Rochas, C., Satoh, T., Borsali, R., Kakuchi, T., *Macromolecules*, 2013, 46, 1461-1469.
5. Isono, T., Otsuka, I., Suemasa, D., Rochas, C., Satoh, T., Borsali, R., Kakuchi, T., *Macromolecules*, **2013**, 46, 8932-8940.
6. Makiguchi, K., Yamanaka, T., Kakuchi, T., Terada, M., Satoh, T., *Chem. Commun.*, **2014**, 50, 2883-2885.
7. Saito, T., Aizawa, Y., Tajima, K., Isono, T., Satoh, T., *Polym. Chem.*, **2015**, 6, 4374-4384.

Curriculum Vitae

Name: **ROBERT B. GRUBBS**

Date of Birth: February 6, 1972

Title: Associate Professor

Affiliation: Stony Brook University,
Department of Chemistry
Stony Brook, NY 11794-3400, USA

Telephone, Fax, E-mail, Website: TEL +1-631-632-7911, FAX +1-631-632-7960
robert.grubbs@stonybrook.edu;
http://www.stonybrook.edu/chemistry/faculty/grubbs.barney.html

Education:

B.A.	Pomona College, 1993
Ph.D.	Cornell University (J.M.J. Fréchet), 1998
Postdoc	University of Minnesota (Frank Bates), 1998 - 2001

Current Appointments:

Stony Brook University, Professor (2009 - present)

Recent Awards:

2015 Kavli Fellow of the National Academy of Sciences
2013 Distinguished Professorship, Donghua University
2012 Sir Yue-Kong Pao Chair Professorship, Ningbo University

Research Interests:

Block and multicomponent polymer synthesis, controlled polymerization, block copolymer hydrogels, responsive materials, copolymer/nanoparticle composites.

Selected Representative Publications:

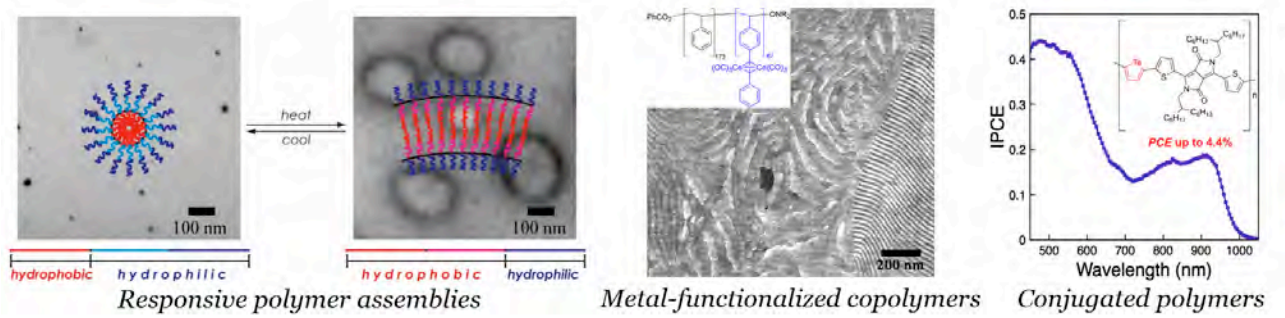
1. Jiang, B.; Hom, W.; Chen, X.; Yu, P.; Pavelka, L.; Kisslinger, K.; Parise, J. B.; Bhatia, S.; Grubbs, R. B. "Magnetic Hydrogels from Alkyne/Cobalt Carbonyl-functionalized ABA Triblock Copolymers." *J. Am. Chem. Soc.* **2016**, *138*, 4616-4625. (doi: 10.1021/jacs.6b01271)
2. Jiang, B.; Nykypanchuk, D.; Endoh, M. K.; Chen, X.; Qian, B.; Kisslinger, K.; Koga, T.; Parise, J. B.; Grubbs, R. B. "Phase behavior of alkyne-functionalized styrenic block copolymer/cobalt carbonyl adducts and in situ formation of magnetic nanoparticles by thermolysis." *Macromolecules* **2016**, *49*, 853-865. (doi: 10.1021/acs.macromol.5b02515)
3. Park, Y.S.; Wu, Q.; Nam, C.-Y.; Grubbs, R.B. "Polymerization of tellurophene derivatives via microwave-assisted palladium-catalyzed ipso-arylative polymerization." *Angew. Chem. Int. Ed.* **2014**, *53*, 10691-10695. (doi: 10.1002/anie.201406068)
4. Park, Y.S.; Kale, T.S.; Nam, C.-Y.; Choi, D.; Grubbs, R. B. "Effects of heteroatom substitution in conjugated heterocyclic compounds on photovoltaic performance: from sulfur to tellurium." *Chem. Commun.* **2014**, *50*, 7964-7967. (doi: 10.1039/C4CC01862A)
5. Nam, C.-Y.; Qin, Y.; Park, Y. S.; Hlaing, H.; Lu, X.; Ocko, B. M.; Black, C. T.; Grubbs, R. B. "Photocrosslinkable azide-functionalized polythiophene for thermally stable bulk heterojunction solar cells." *Macromolecules* **2012**, *45*, 2338-2347. (doi: 10.1021/ma3001725)

Building responsive materials from the bottom up with self-assembling block copolymers

Robert B. Grubbs

Department of Chemistry
Stony Brook University
Stony Brook, NY 11794-3400, USA
Email: robert.grubbs@stonybrook.edu

The control over molecular structure that has been enabled by the continued development of new synthetic techniques has translated to continually improving control over the assembly of molecules and macromolecules. We have designed and synthesized several classes of copolymers with stimulus-responsive components and metal-binding sites. These polymers form assemblies with properties that are dependent upon specific conditions. For example, we have investigated a range of synthetic systems that are designed to assemble in water into smaller micellar aggregates at low temperatures and larger vesicles at higher temperatures.[1] A number of factors, including block size and extent of interblock interactions, appear to be important in controlling transformation rate. The design of these and other systems, including metal-functionalized polymers[2] and conjugated polymers for photovoltaic applications,[3] and our efforts to better understand the behavior of the resulting materials will be discussed.



References

1. (a) Cai, Y.; Aubrecht, K. B.; Grubbs, R. B., Thermally Induced Changes in Amphiphilicity Drive Reversible Restructuring of Assemblies of ABC Triblock Copolymers with Statistical Polyether Blocks. *J. Am. Chem. Soc.* **2011,** *133*, 1058-1065. doi: 10.1021/ja109262h; (b) Sundararaman, A.; Stephan, T.; Grubbs, R. B., Reversible Restructuring of Aqueous Block Copolymer Assemblies through Stimulus-Induced Changes in Amphiphilicity. *J. Am. Chem. Soc.* **2008,** *130*, 12264-12265. doi: 10.1021/ja8052688.
2. (a) Jiang, B.; Nykypanchuk, D.; Endoh, M. K.; Chen, X.; Qian, B.; Kisslinger, K.; Koga, T.; Parise, J. B.; Grubbs, R. B., Phase Behavior of Alkyne-Functionalized Styrenic Block Copolymer/Cobalt Carbonyl Adducts and in Situ Formation of Magnetic Nanoparticles by Thermolysis. *Macromolecules* **2016,** *49*, 853-865. doi: 10.1021/acs.macromol.5b02515; (b) Jiang, B.; Hom, W. L.; Chen, X.; Yu, P.; Pavelka, L. C.; Kisslinger, K.; Parise, J. B.; Bhatia, S. R.; Grubbs, R. B., Magnetic Hydrogels from Alkyne/Cobalt Carbonyl-Functionalized ABA Triblock Copolymers. *J. Am. Chem. Soc.* **2016,** *138*, 4616-4625. doi: 10.1021/jacs.6b01271.
3. (a) Park, Y. S.; Wu, Q.; Nam, C.-Y.; Grubbs, R. B., Polymerization of Tellurophene Derivatives by Microwave-Assisted Palladium-Catalyzed ipso-Arylative Polymerization. *Angew. Chem. Int. Ed.* **2014,** *53*, 10691-10695. doi: 10.1002/anie.201406068; (b) Park, Y. S.; Kale, T. S.; Nam, C. Y.; Choi, D.; Grubbs, R. B., Effects of heteroatom substitution in conjugated heterocyclic compounds on photovoltaic performance: from sulfur to tellurium. *Chem. Commun.* **2014,** *50*, 7964-7967. doi: 10.1039/C4CC01862A.

Curriculum Vitae

Name: **TSUYOSHI SEKITANI**

Date of Birth: January 6, 1977

Title: Professor

Affiliation: Osaka University, The Institute of Scientific and Industrial Research, Ibaraki, Osaka 567-0047, Japan

Telephone, Fax, E-mail, Website: TEL +81-6-6879-8400, FAX +81-6-6879-8404
sekitani@sanken.osaka-u.ac.jp; http://www.sanken.osaka-u.ac.jp/labs/aed/

Education: B.A. Osaka University, 1999
Ph.D. University of Tokyo, 2003

Appointments:

University of Tokyo, Research Associate (2003-2009)
University of Tokyo, Lecture (2009-2010)
University of Tokyo, Associate Professor (2011-2014)
Osaka University, Professor (2014 - present)

Recent Awards:

2016 The Japan Society for the Promotion of Science Award
2015 Young Scientist Award from the Minister of Education, Culture, Sports, Science and Technology, Japan
2014 Highly Cited Researchers (The World's Most Influential Scientific Mind) from THOMSON REUTERS.
2010 IEEE Paul Rappaport Award
2009 IEEE Paul Rappaport Award

Research Interests:

Flexible Electronic Systems, Organic Electronics and Transistors, Plastic Integrated Circuits, Large-area Sensors, Medical Electronics, Wearable and Implantable Electronics

Selected Representative Publications:

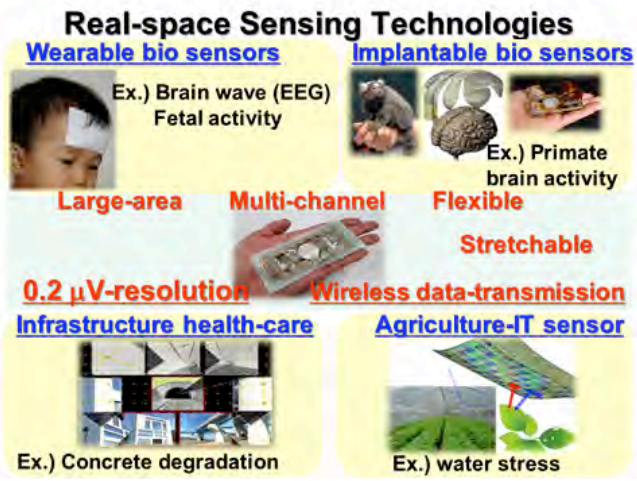
1. Tsuyoshi Sekitani, et. al., "Ultraflexible organic amplifier with biocompatible gel electrode", *Nature Communications*, in press (2016).
2. Martin Kaltenbrunner, Tsuyoshi Sekitani, et. al., "Ultrathin and lightweight organic solar cells with high flexibility", *Nature* Vol. 458, pp. 499-463 (2013).
3. Tsuyoshi Sekitani, et. al., "Flexible organic transistors and circuits with extreme bending stability", *Nature Materials* Vol. 9, pp. 1015-1022 (2010).
4. Tsuyoshi Sekitani, et. al., "Nonvolatile Memory Transistors for Flexible Sensor Arrays", *Science* Vol. 326, pp. 1516-1519 (2009).
5. Tsuyoshi Sekitani, et. al., "Stretchable active-matrix organic light-emitting diode display using printable elastic conductors", *Nature Materials* Vol. 8, pp. 494-499 (2009).
6. Tsuyoshi Sekitani, et. al., "Organic transistors manufactured using inkjet technology with subfemtoliter accuracy", *Proc. Natl. Acad. Sci. USA* Vol. 105, pp.4976-4980 (2008).
7. Tsuyoshi Sekitani, et. al., "Rubber-like stretchable active matrix using elastic conductors", *Science* Vol. 321, pp. 1468-1472 (2008).
8. Tsuyoshi Sekitani, et. al., "A large-area wireless power-transmission sheet using printed transistors and plastic MEMS switches", *Nature Materials* Vol. 6, pp. 413-417 (2007).

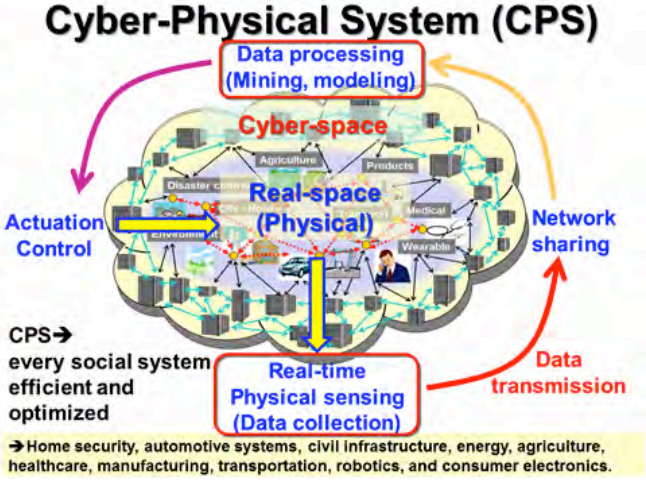
Large-area, Ultraflexible, Organic Sensors for Cyber-Physical Systems

Tsuyoshi Sekitani

The Institute of Scientific and Industrial Research,
Osaka University
8-1 Mihogaoka, Ibaraki, Osaka 567-0047, Japan
Email: sekitani@sanken.osaka-u.ac.jp

I will present recent progresses and future prospects of large-area, ultraflexible, and ultrathin electronic sensors. My works focus on integration technologies of ultraflexible thin-film electronics comprising ultrasoft gel electrodes, organic thin-film amplifier, Si-LSI platform consisting of wireless module and analog-digital converter, thin-film battery, and information engineering, which are imperceptible active sensors for Cyber-Physical Systems (CPS). Here I would like to demonstrate the applications of sheet-type wireless sensors for monitoring bio-signals, which can detect changes in electric potentials whose measurement accuracy is 0.2 microvolt. Taking full advantages of these technologies of ultraflexible electronics, I will demonstrate the manufacturing of wearable and implantable brain wave (Electroencephalogram: EEG) monitoring systems.

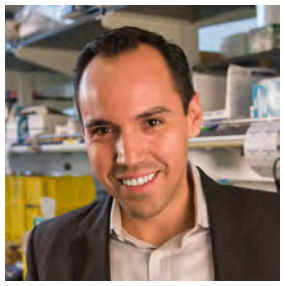




References

1. Tsuyoshi Sekitani, et. al., "Ultraflexible organic amplifier with biocompatible gel electrode", *Nature Communications*, in press (2016).
2. Martin Kaltenbrunner, Tsuyoshi Sekitani, et. al., "Ultrathin and lightweight organic solar cells with high flexibility", *Nature* Vol. 458, pp. 499-463 (2013).
3. Tsuyoshi Sekitani, et. al., "Flexible organic transistors and circuits with extreme bending stability", *Nature Materials* Vol. 9, pp. 1015-1022 (2010).
4. Tsuyoshi Sekitani, et. al., "Nonvolatile Memory Transistors for Flexible Sensor Arrays", *Science* Vol. 326, pp. 1516-1519 (2009).
5. Tsuyoshi Sekitani, et. al., "Stretchable active-matrix organic light-emitting diode display using printable elastic conductors", *Nature Materials* Vol. 8, pp. 494-499 (2009).
6. Tsuyoshi Sekitani, et. al., "Organic transistors manufactured using inkjet technology with subfemtoliter accuracy", *Proc. Natl. Acad. Sci. USA* Vol. 105, pp.4976-4980 (2008).
7. Tsuyoshi Sekitani, et. al., "Rubber-like stretchable active matrix using elastic conductors", *Science* Vol. 321, pp. 1468-1472 (2008).
8. Tsuyoshi Sekitani, et. al., "A large-area wireless power-transmission sheet using printed transistors and plastic MEMS switches", *Nature Materials* Vol. 6, pp. 413-417 (2007).

Curriculum Vitae



Name: **LUIS M. CAMPOS**

Date of Birth: July 30, 1978

Title: Assistant Professor

Affiliation: Columbia University, Department of Chemistry,
3000 Broadway, MC3124
New York, NY 10027, USA

Telephone, E-mail, Website: TEL +1-212-854-9561
lcampos@columbia.edu; www.somoscampos.org

Education:

B.S.	CSU Dominguez Hills, 2001
Ph.D.	UCLA, 2006
Postdoc	UCSB (Craig J. Hawker), 2001 - 2010

Current Appointments:

Columbia University, Assistant Professor (2011 - present)

Recent Awards:

2016	Arthur C. Cope Scholar Award
2016	Journal of Physical Organic Chemistry Award for Early Excellence
2015	Office of Naval Research Young Investigator Award
2015	Cottrell Scholar Award
2014	NSF CAREER Award
2014	3M Non-Tenured Faculty Award

Research Interests:

Singlet Fission Materials, Organic Electronics, Block Copolymer Self-Assembly, Novel Polyelectrolytes, Processing 2D-Materials

Selected Representative Publications:

1. Fuemmeler, E.; Sanders, S. N.; Pun, A. B.; Kumarasamy, E.; Zeng, T.; Miyata, K.; Steigerwald, M. L.; Zhu, X.-Y.; Sfeir, M. Y.; Campos, L. M.; Ananth, N. "The Mechanism of Ultrafast Intramolecular Singlet Fission as Evidenced in Bipentacenes." *ACS Cent. Sci.* **2016**, In Press.
2. Capozzi, B.; Xia, J.; Adak, O.; Dell, E. J.; Liu, Z.-F.; Taylor, J. C.; Neaton, J. B.; Campos, L. M.; Venkataraman, L. "Single-Molecule Diodes with High Rectification Ratios through Environmental Control." *Nature Nanotech.* **2015**, *10*, 522-527.
3. Dell, E. J.; Capozzi, B.; Xia, J.; Venkataraman, L.; Campos, L. M. "Molecular Length Dictates the Nature of Charge Carriers in Single-Molecule Junctions of Oxidized Oligothiophenes." *Nature Chem*. **2015**, *7*, 209-214.
4. Jiang, Y.; Freyer, J. L.; Cotanda, P.; Brucks, S. D.; Killops, K. L.; Bandar, J. S.; Torsitano, C.; Balsara, N. P.; Lambert, T. H.; Campos, L. M. "The Evolution of Cyclopropenium Ions into Functional Polyelectrolytes." *Nat. Commun.* **2015**, *6*, 5950.
5. Busby, E.; Xia, J.; Wu, Q.; Low, J. Z.; Song, R.; Miller, J. R.; Zhu, X.-Y.; Campos, L. M., Sfeir, M. Y. "A Design Strategy for Intramolecular Singlet Fission Mediated by Charge-Transfer States in Donor-Acceptor Organic Materials." *Nature Mater*. **2015**, *14*, 426-433.

Designing Functional Materials from Unconventional Building Blocks

Luis M. Campos

Department of Chemistry
Columbia University
New York, NY 10027, USA
Email: lcampos@columbia.edu

Polymers offer a rich palate to be decorated with functional units in order to tune various properties, and to harness the collective interactions of the building blocks that can be exploited for technological advances. However, introducing functionality can alter the supramolecular interactions leading to unpredictable behavior. Our group is interested in using building blocks that are commonly overlooked or difficult to synthesize by conventional strategies in order to exploit organic materials in multiple applications ranging from energy storage/generation, single molecule electronics, and biology. This talk will provide an overview on the chemistry and uses of new and old monomers that are enabling advancements in materials science.

References

1. Fuemmeler, E.; Sanders, S. N.; Pun, A. B.; Kumarasamy, E.; Zeng, T.; Miyata, K.; Steigerwald, M. L.; Zhu, X.-Y.; Sfeir, M. Y.; Campos, L. M.; Ananth, N. "The Mechanism of Ultrafast Intramolecular Singlet Fission as Evidenced in Bipentacenes." *ACS Cent. Sci.* **2016**, In Press.
2. Capozzi, B.; Xia, J.; Adak, O.; Dell, E. J.; Liu, Z.-F.; Taylor, J. C.; Neaton, J. B.; Campos, L. M.; Venkataraman, L. "Single-Molecule Diodes with High Rectification Ratios through Environmental Control." *Nature Nanotech.* **2015**, *10*, 522-527.
3. Dell, E. J.; Capozzi, B.; Xia, J.; Venkataraman, L.; Campos, L. M. "Molecular Length Dictates the Nature of Charge Carriers in Single-Molecule Junctions of Oxidized Oligothiophenes." *Nature Chem.* **2015**, *7*, 209-214.
4. Jiang, Y.; Freyer, J. L.; Cotanda, P.; Brucks, S. D.; Killops, K. L.; Bandar, J. S.; Torsitano, C.; Balsara, N. P.; Lambert, T. H.; Campos, L. M. "The Evolution of Cyclopropenium Ions into Functional Polyelectrolytes." *Nat. Commun.* **2015**, *6*, 5950.
5. Busby, E.; Xia, J.; Wu, Q.; Low, J. Z.; Song, R.; Miller, J. R.; Zhu, X.-Y.; Campos, L. M., Sfeir, M. Y. "A Design Strategy for Intramolecular Singlet Fission Mediated by Charge-Transfer States in Donor-Acceptor Organic Materials." *Nature Mater.* **2015**, *14*, 426-433.

Curriculum Vitae

Name: **TAKASHI KATO**

Date of Birth: April 22, 1959

Title: Professor

Affiliation: The University of Tokyo, School of Engineering,
Department of Chemistry and Biotedhnology
7-3-1 Hongo, Bunkyo-ku Tokyo 113-8656, Japan

Telephone, Fax, E-mail, Website: TEL: +81-3-5841-7440, FAX: +81-3-5841-8661,
kato@chiral.t.u-tokyo.ac.jp, http://kato.t.u-tokyo.ac.jp/index-e.html

Education:
B.S. The University of Tokyo, 1983
Ph.D. The University of Tokyo, 1988
Postdoc Cornell University (Prof. Jean M. J. Frechet), 1988-1989

Current Appointments:

Professor, The University of Tokyo, Department of Chemistry and Biotechnology, School of Engineering (2000 - present)
Research Supervisor of PREST Research "Molecular Technology" of Japan Science and Technology Agency (JST) (2012-present)
Editor-in-chief, *Polymer Journal* (2012-present)

Recent Awards:

2014 Fellow of the Royal Society of Chemistry
2012 The Japanese Liquid Crystal Society (JLCS) Awards
2010 The Award of the Society of the Polymer Science, Japan
2008 The Award of Japanese Liquid Crystal Society
2005 The 1st JSPS Prize
2003 The 17th IBM Japan Science Award

Research Interests:

Design, Synthesis, Structural Control, and Functionalization of Self-Assembled Materials and Hybrid Materials

Selected Publications:

1. Sagara Y.; Yamane S.; Mitani M.; Weder C.; Kato T. "Mechanoresponsive Luminescent Molecular Assemblies: An Emerging Class of Materials" *Adv. Mater.* **2016**, *28*, 1073-1095
2. Soberats B.; Yoshio M.; Ichikawa T.; Zeng X.; Ohno H.; Ungar G.; Kato T. "Ionic Switch Induced by a Rectangular-Hexagonal Phase Transition in Benzenammonium Columnar Liquid Crystals" *J. Am. Chem. Soc.,* **2015**, *137*, 13212-13215.
3. Hogberg D.; Soberats B.; Uchida S.; Yoshio M.; Kloo L.; Segawa H.; Kato T. "Nanostructured Two-Component Liquid-Crystalline Electrolytes for High Temperature Dye-Sensitized Solar Cells" *Chem. Mater.*, **2014**, *24*, 6496-6502.
4. Soberats B.; Uchida E.; Yoshio M.; Kagimoto J.; Ohno H.; Kato T. "Macroscopic Photocontrol of Ion-Transporting Pathways of a Nanostructured Imidazolium-Based Photoresponsive Liquid Crystal" *J. Am. Chem. Soc.*, **2014,** *136*, 9552-9555.
5. Soberats B.; Yoshio M.; Ichikawa T.; Taguchi S.; Ohno H.; Kato T. "3D Anhydrous Proton-Transporting Nanochannels Formed by Self-Assembly of Liquid Crystals Composed of a Sulfobetaine and a Sulfonic Acid" *J. Am. Chem. Soc.*, **2013**, *135*, 15286-15289.

Functional Liquid-Crystalline Assemblies for Energy and Environment

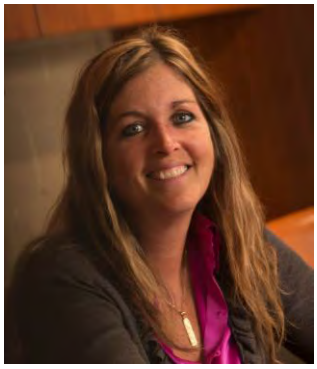
Takashi Kato
Department of Chemistry and Biotechnology, School of Engineering, The University of Tokyo, Hongo, Bunkyo-ku, Tokyo 113-8656, Japan
e-mail address: kato@chiral.t.u-tokyo.ac.jp

The development of functional liquid-crystalline materials for use of electrolytes[1], water treatment membranes, and templates for hybrid formation is described. Design of molecular shape and control of molecular interactions and formation of nanostructure are keys for the development of these functional materials.[1-5] The orientation control and switching of conductivities were achieved for ionic liquid crystals.[2,3] These ionic nanostructured assemblies are also applied to the electrolytes for lithium ion batteries.[4] Another approach is to develop bio-inspired environmentally friendly hybrid materials based on liquid-crystalline orientation. Chiral liquid-crystalline materials are used as templates for the crystallization of calcium carbonate. Environmentally friendly hybrid materials have been obtained.[6] Calcium carbonate nanorods, which show liquid-crystalline behaviour are obtained. Aligned solid thin-films consisting of nanorods have been formed by orientation by mechanical sharing.[7]

References

1. Kato T. “From Nanostructured Liquid Crystals to Polymer-Based Electrolytes” *Angew. Chem. Int. Ed.,* **2010**, *49*, 7847-7848.
2. Soberats B.; Uchida E.; Yoshio M.; Kagimoto J.; Ohno H.; Kato T. “Macroscopic Photocontrol of Ion-Transporting Pathways of a Nanostructured Imidazolium-Based Photoresponsive Liquid Crystal” *J. Am. Chem. Soc.*, **2014,** *136*, 9552-9555.
3. Soberats B.; Yoshio M.; Ichikawa T.; Zeng X.; Ohno H.; Ungar G.; Kato T. “Ionic Switch Induced by a Rectangular-Hexagonal Phase Transition in Benzenammonium Columnar Liquid Crystals” *J. Am. Chem. Soc.,* **2015**, *137*, 13212-13215.
4. Sakuda J.; Hosono E.; Yoshio M.; Ichikawa T.; Matsumoto T.; Ohno H.; Zhou H.; Kato T. “Liquid-Crystalline Electrolytes for Lithium-Ion Batteries: Ordered Assemblies of a Mesogen-Containing Carbonate and a Lithium Salt” *Adv. Funct. Mater*., **2015**, *25*, 1206-1212.
5. Henmi M.; Nakatsuji, K.; Ichikawa T.; Tomioka H.; Sakamoto T.; Yoshio M.; Kato T. “Self-Organized Liquid-Crystalline Nanostructured Membranes for Water Treatment: Selective Permeation” *Adv. Mater.*, **2012**, 24, 2238.
6. Matsumura. S.; Kajiyama S.; Nishimura T.; Kato T. “Formation of Helically Structured Chitin/$CaCO_3$ Hybrids through an Approach Inspired by the Biomineralization Processes of Crustacean Cuticles”, *Small*, **2015**, *11*, 5127-5133 .
7. Nakayama M.; Kajiyama S.; Nishimura T.; Kato T. “Liquid-Crystalline Calcium Carbonate: Biomimetic Synthesis and Alignment of Nanorod Calcite” *Chem. Sci.*, **2015**, *6*, 6230-6234.

Curriculum Vitae



Name: **KAREN L. WOOLEY**

Date of Birth: July 9, 1966

Title: W. T. Doherty-Welch Chair and University Distinguished Professor

Affiliation: Texas A&M University
Department of Chemistry, Department of Chemical Engineering, Department of Materials Science & Engineering
College Station, TX 77842, USA

Telephone, Fax, E-mail, Website: TEL +1-979-845-4077, FAX +1-979-862-1137
wooley@chem.tamu.edu; http:// www.chem.tamu.edu/faculty/wooley

Education: B.S. Oregon State University, 1988
Ph.D. Cornell University, 1993

Current Appointments:

Professor of Materials Science & Engineering, Texas A&M University, 2014 – present
University Distinguished Professor, Texas A&M University, 2011 – present
W. T. Doherty-Welch Chair in Chemistry; Professor of Chemistry; Professor of Chemical Engineering, Texas A&M University, 2009 – present

Recent Awards:

2016 Distinguished Research Achievement Award, Texas A&M University Association of Former Students
2015 American Academy of Arts & Sciences Fellow
2015 Oesper Award, University of Cincinnati Department of Chemistry
2014 Honorary Fellow of the Chinese Chemical Society
2014 Fellow of the Royal Society of Chemistry
2014 Royal Society of Chemistry Centenary Prize
2014 American Chemical Society Award in Polymer Chemistry

Research Interests:

Organic and polymer synthesis; novel macromolecular nanostructures for biomedical and materials applications; degradable polymers; nanoscale polymer assemblies; functional polymers; polymer modification.

Selected Representative Publications:

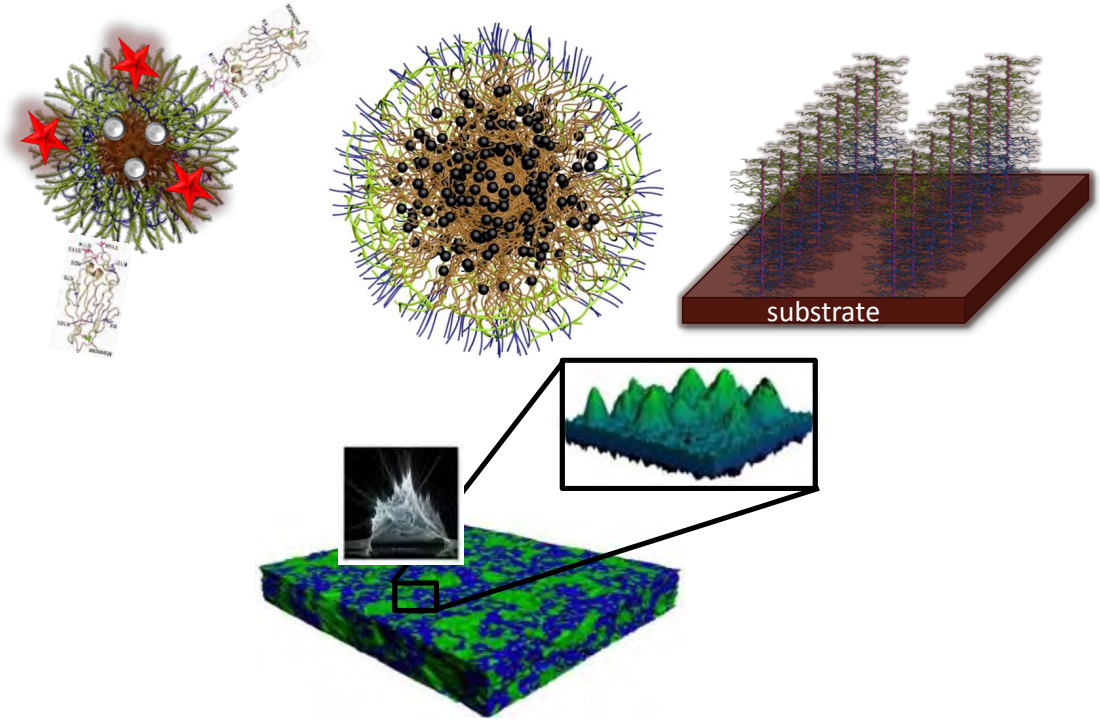
1. He, X.; Fan, J.; Wooley, K. L. "Stimuli-triggered Sol-Gel Transitions of Polypeptide Gels Derived from *N*-carboxyanhydride (NCA) Polymerizations", *Chem. Asian J.*, **2016**, *11*, 437–447.
2. Zigmond, J. S.; Pollack, K. A.; Smedley, S.; Raymond, J. E.; Link, L. A.; Pavia-Sanders, A.; Hickner, M. A.; Wooley, K. L. "Investigation of Intricate, Amphiphilic Crosslinked Hyperbranched Fluoropolymers as Anti-icing Coatings for Extreme Environments", *J. Polym. Sci., Part A: Polym. Chem.*, **2016**, *54*(2), 238–244.
3. Noel, A.; Borguet, Y. P.; Wooley, K. L. "Self-reporting Degradable Fluorescent Grafted Copolymer Micelles Derived from Biorenewable Resources", *ACS Macro Lett.*, **2015**, *4*(6), 645-650, DOI: 10.1021/acsmacrolett.5b00227.
4. Flores, J. A.; Pavia-Sanders, A.; Chen, Y.; Pochan, D. J.; Wooley, K. L. "Recyclable Hybrid Inorganic/Organic Magnetically-active Networks for the Sequestration of Crude Oil from Aqueous Environments", *Chem. Mater.*, **2015**, *27*, 3775-3782.
5. Zhang, F.; Smolen, J. A.; Zhang, S.; Li, R.; Shah, P. N.; Cho, S.; Wang, H.; Raymond, J. E.; Cannon, C. L.; Wooley, K. L. "Degradable polyphosphoester-based silver-loaded nanoparticles as therapeutics for bacterial lung infections", *Nanoscale*, **2015**, *7*, 2265-2270.

Advanced Applications for Sophisticated Nanoscopic Devices (Realized by the Power of Chemistry, with Attention to Sustainability)

Karen L. Wooley

Departments of Chemistry, Chemical Engineering, and Materials Science & Engineering
Texas A&M University
College Station, Texas, USA
Email: wooley@chem.tamu.edu

This presentation will highlight a progression of synthetic strategies for the preparation of functional polymer materials, where each strategy and material design is inspired by a targeted application. The evolution of nanostructured materials that originate from the supramolecular assembly of macromolecular building blocks, from relatively simple overall shapes and internal morphologies to those of increasing complexity, is driving the development of synthetic methodologies that allow for the preparation of increasingly complex macromolecular structures. Moreover, the inclusion of functional units within selective compartments/domains is of great importance to create (multi)functional materials. We have a special interest in the study of nanoscopic macromolecules, with well-defined composition, structure and topology, as components that are programmed for the formation of sophisticated nanoscopic objects in solution. Another primary interest in the Wooley laboratory is the production of functional polymers from renewable sources that are capable of reverting to those natural products once their purpose has been served. Our recent work has included the construction of polymers and nanostructured materials from natural products that exhibit unique physicochemical, mechanical and/or biological activities, including for instance therapeutic effects to treat inflammation, infectious diseases or cancer, properties designed for orthopedic device applications, hybrid magnetic-organic characteristics for pollutant recovery, asymmetric structures for ultra-high resolution photoresist technologies, or topographically- and morphologically-complex copolymer networks as anti-biofouling and anti-icing coatings.



Curriculum Vitae

Name: **NOBUO KIMIZUKA**

Date of Birth: March 23, 1960

Title: Professor

Affiliation: Kyushu University, Graduate School of Engineering,
Department of Chemistry and Biochemistry,
Center for Molecular Systems (CMS), Kyushu University
744 Moto-oka, Nishi-ku, Fukuoka 819-6304, Japan

Telephone, Fax, E-mail, Website: TEL +81-92-802-2832, FAX +81-92-802-2838
kimizuka.nobuo.763@m.kyushu-u.ac.jp;
http://www.chem.kyushu-u.ac.jp/~kimizuka/

Education:
B.S. Kyushu University, 1982
Ph.D. Kyushu University, 1990
Postdoc Mainz University (Helmut Ringsdorf), 1990-1991

Current Appointments:
Kyushu University, Professor (2000 - present)
The Science Council of Japan, Associate Member (2011 - present)
Senior Program Officer of Research Center for Science Systems, JSPS (2016 - present)

Recent Awards:
1999 Kao Research Initiative Award, The Kao Foundation of Arts and Sciences.
2003 Wiley Award, The Society of Polymer Science, Japan (SPSJ)
2007 The Chemical Society of Japan Award for Creative Work
2012 The Award of the Society of Polymer Science, The Society of Polymer Science, Japan (SPSJ)
2013 Prizes for Science and Technology, The Minister of Education, Culture, Sports, Science and Technology.

Research Interests:
Molecular self-assembly widely from organic, inorganic and biomolecules and their functions.
Development of photofunctional molecular systems with controlled energy landscapes.
Photon upconversion in molecular self-assembled systems.

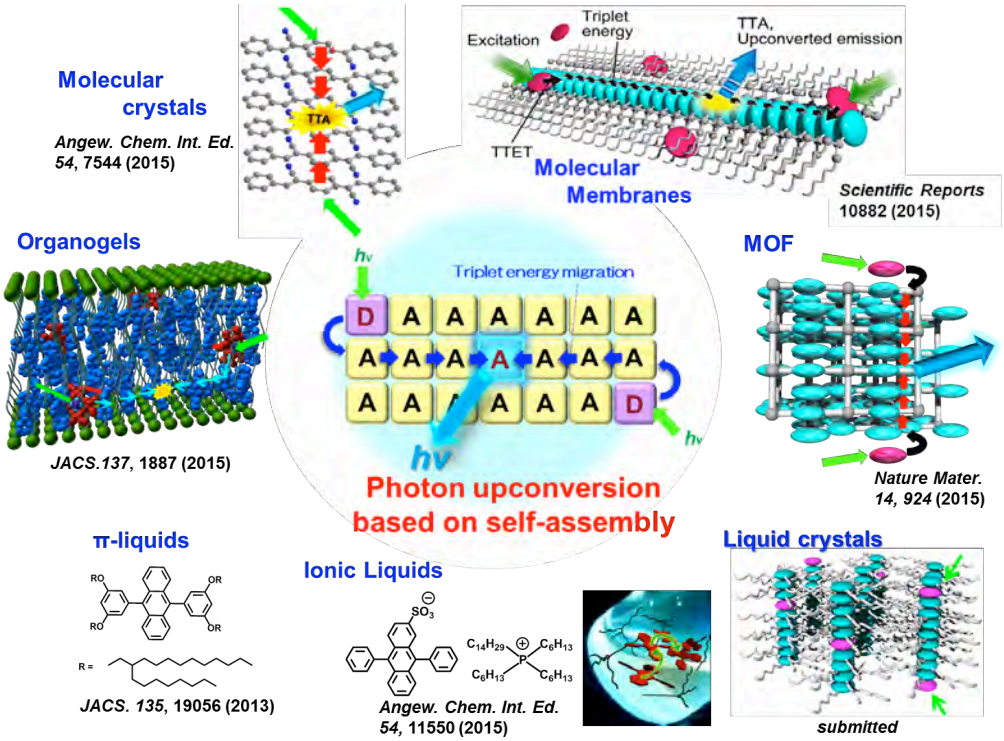
Selected Representative Publications:
1. Yanai, N.; Kimizuka, N. “Recent Emergence of Photon Upconversion based on Triplet Energy Migration in Molecular Assemblies” *Chem. Commun*. **2016**, *52*, 5354-5370.
2. S. Hisamitsu, N. Yanai, N., Kimizuka. “Photon-Upconverting Ionic Liquids: Effective Triplet Energy Migration in Contiguous Ionic Chromophore Arrays”, *Angew. Chem. Int. Ed.* **2015**, *54*, 11550-11554.
3. P. Mahato, A. Monguzzi, N. Yanai, T. Yamada, N. Kimizuka” "Fast and Long-range Triplet Exciton Diffusion in Metal-organic Frameworks for Photon Upconversion at Ultralow Excitation Power" *Nat. Mater.*, **2015**, *14*, 924-930.
4. T. Ogawa, N. Yanai, A. Monguzzi, N. Kimizuka. “Highly Efficient Photon Upconversion in Self-Assembled Light-Harvesting Molecular Systems”, *Sci. Rep*., **2015**, *5*, 10882.
5. K. Ishiba, M-a. Morikawa, C. Chikara, T. Yamada, K. Iwase, M. Kawakita, N. Kimizuka. “Photoliquefiable Ionic Crystals: A Phase Crossover Approach for Photon Energy Storage Materials with Functional Multiplicity”, *Angew. Chem.Int. Ed*., **2015**, *54*, 1532-1536.
6. R. Kuwahara, S. Fujikawa, K. Kuroiwa, N. Kimizuka. “Controlled Polymerization and Self-Assembly of Halogen-Bridged Diruthenium Complexes in Organic Media and Their Dielectrophoretic Alignment”, *J. Am. Chem. Soc*., **2012**, *134***,** 1192-1199.

Photon Upconversion based on Self-Assembled Molecular Systems

Nobuo Kimizuka

Department of Chemistry and Biochemistry
Graduate School of Engineering, Center for Molecular Systems (CMS), Kyushu University
744 Moto-oka, Nishi-ku, Fukuoka, Japan
Email: kimizuka.nobuo.763@m.kyushu-u.ac.jp

Triplet-triplet annihilation-based photon upconversion (TTA-UC) has been attracting much attention as a promising methodology which can be applied in many sunlight-based energy conversion systems. To date, efficient TTA-UC has been achieved in organic solutions because the molecular diffusion of triplet molecules is essential for both the triplet energy transfer and annihilation processes. However, the diffusion constant of chromophores in such low-viscosity solvent, i.e. the rate constant of TTA, is not high enough to maximize the UC quantum yield at low solar irradiance. To solve these problems, we introduced the concepts of energy migration in ordered molecular self-assemblies[1] to achieve efficient TTA-UC in designed molecular systems. In this talk, our recent development on the self-assembly-based TTA-UC in varied molecular systems will be discussed.[2-9]



References

1. Nakashima, T.; Kimizuka, N.; *Adv. Mater*. **2002**, *14*, 1113-1116.
2. Duan, P., Yanai, N.; Kimizuka, N. *J. Am. Chem. Soc*. **2013**, *135*, 19056-19059.
3. Duan, P.; Yanai, N.; Nagatomi, H.; Kimizuka, N. *J. Am. Chem. Soc*. **2015**, *137*, 1887-1894.
4. Duan, P.; Yanai, N.; Kurashige,Y.; Kimizuka, N. *Angew. Chem. Int. Ed*. **2015**, *54*, 7544-7549.
5. Ogawa, T.; Yanai, N.; Monguzzi, A.; Kimizuka, N. *Sci. Rep*. **2015**, *5*, 10882.
6. Mahato, P. Monguzzi, A.; Yanai, N.; Kimizuka, N. *Nat. Mater*. **2015**, *14*, 924-930.
7. Hisamitsu, S.; Yanai, N.; Kimizuka, N. *Angew. Chem. Int. Ed*. **2015**, *54*, 11550-11554.
8. Hosoyamada, M.; Yanai, N.; Ogawa, T.; Kimizuka, N. *Chem. Eur. J*. **2016**, *22*, 2060-2067.
9. Yanai, N.; Kimizuka, N. *Chem. Commun*. **2016**, *52*, 5354-5370 (Feature Article).

DAY FOUR

(Monday, June 27)

CURRICULA VITAE AND ABSTRACTS

Curriculum Vitae

Name: **MARC HILLMYER**

Date of Birth: June 20, 1967

Title: Professor

Affiliation: Department of Chemistry
University of Minnesota
Minneapolis, MN 55455 USA

Telephone, Fax, E-mail, Website: TEL +1-612-625-7834, FAX +1-612-625-7834
hillmyer@umn.edu; http://hillmyer.chem.umn.edu

Education:

B.S.	University of Florida, 1989
Ph.D.	California Institute of Technology, 1994
Postdoc	University of Minnesota (Frank S. Bates), 1994–1997

Current Appointments:

University of Minnesota, Professor (2009–present)
Center for Sustainable Polymers, Director (2009–present)
Macromolecules, Associate Editor (2007–present)

Recent Awards:

2015	McKnight Presidential Endowed Chair (UMN)
2014	Postbaccalaureate, Graduate, and Professional Education Award (UMN)
2013	PTN Medema Award
2012	Fellow of the Polymer Chemistry (POLY) Division of the ACS
2011	Carl S. Marvel Creative Polymer Chemistry Award (POLY)
2009	Fellow of the American Association for the Advancement of Science (AAAS)

Research Interests:

Polymer synthesis, Sustainable polymers, Block polymer synthesis/self-assembly, and Nanostructured materials

Selected Representative Publications:

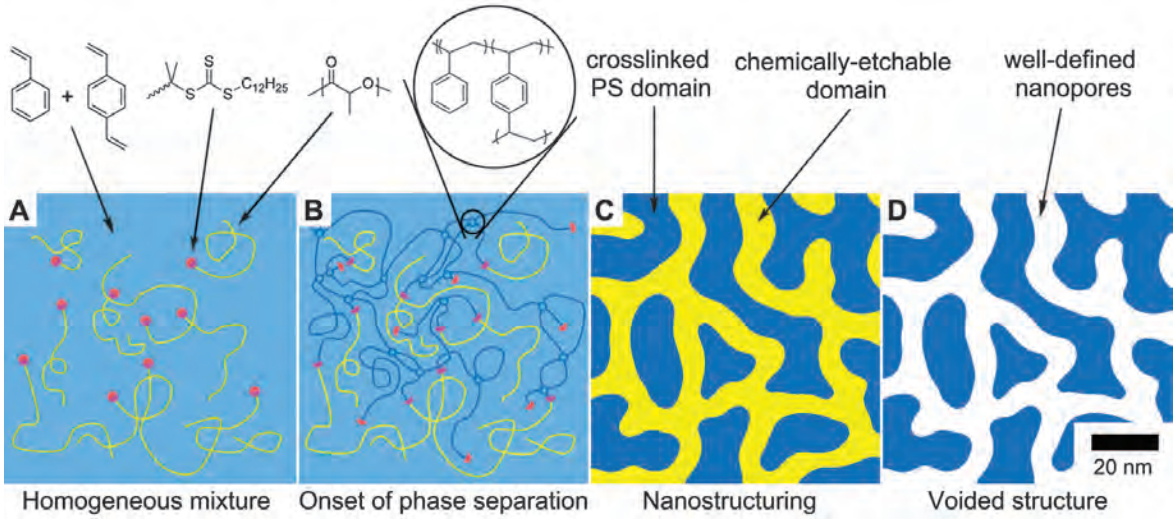
1. Schulze, M. W.; Sinturel, C.; Hillmyer, M. A. "Poly(cyclohexylethylene)-block-poly(ethylene oxide) Block Polymers for Metal Oxide Templating" *ACS Macro Lett.* **2015**, *4*, 1027−1032. DOI: 10.1021/acsmacrolett.5b00458
2. Saba, S. A.; Mousavi, M. P. S.; Bühlmann, P.; Hillmyer, M. A. "Hierarchically Porous Polymer Monoliths by Combining Controlled Macro- and Microphase Separation" *J. Am. Chem. Soc.* **2015**, *137*, 8896–8899. DOI: 10.1021/jacs.5b04992.
3. Hillmyer, M. A.; Tolman, W. B. "Aliphatic Polyester Block Polymers: Renewable, Degradable, and Sustainable" *Acc. Chem. Res.* **2014**, *47*, 2390–2396. DOI: 10.1021/ar500121d
4. Schulze, M. W.; McIntosh, L. D.; Hillmyer, M. A.; Lodge, T. P. "High-Modulus, High-Conductivity Nanostructured Polymer Electrolyte Membranes via Polymerization-Induced Phase Separation" *Nano Lett.* **2014**, *14*, 122–126. DOI: 10.1021/nl4034818
5. Seo, M.; Hillmyer, M. A. "Reticulated Nanoporous Polymers by Controlled Polymerization-Induced Microphase Separation" *Science* **2012**, *336*, 1422–1425. DOI: 10.1126/science.1221383

Bicontinuous Nanostructure Recipes using Block Polymers as Key Ingredients

Marc Hillmyer

Department of Chemistry
University of Minnesota
Minneapolis, Minnesota 55455 USA
Email: hillmyer@umn.edu

Block polymers are remarkable hybrid materials that can self-assemble on nanoscopic length scales. By controlling the composition, architecture, connectivity and molar mass, synthetic chemists can finely tune the morphologies adopted by these materials. Of the typical morphologies accessible from block polymer, bicontinuous phases such as the gyroid structure have been targeted due to their special utility in various applications that require interpenetrating domains structured on the nanoscale.[1] While pre-formed block polymers can be designed to self-assemble into bicontinuous nanostructures, the window of thermodynamic stability is often quite narrow, and thus such structures can be difficult to experimentally access. In this presentation I will discuss the design, synthesis, self-assembly and applications of block polymers formed in situ using controlled polymerizations such that the chemical synthesis and their self-assembly occur in a single process.[2] One of the important elements necessary for the adoption of bicontinuous structures is that the block polymer is crosslinked during synthesis to form a thermosetting material that results in chemical fixation of the final morphology. I will discuss how we discovered this approach, mechanistic consideration associated with the formation of bicontinuous structures, and applications of the resulting nanostructured materials in, for example, polymer electrolyte membranes for use in batteries and fuel cells.[3]



References

1. Crossland, E. J. W.; Kamperman, M.; Nedelcu, M.; Ducati, C.; Wiesner, U.; Smilgies, D. -M.; Toombes, G. E. S.; Hillmyer, M. A.; Ludwigs, S.; Steiner, U.; Snaith, H. J. *Nano Letters* **2009**, *9*, 2807–2812. DOI: 10.1021/nl803174p
2. Seo, M.; Hillmyer, M. A. *Science* **2012**, *336*, 1422–1425. DOI: 10.1126/science.1221383
3. McIntosh, L. D.; Schulze, M. W.; Irwin, M. T.; Hillmyer, M. A.; Lodge, T. P. *Macromolecules* **2015**, *48*, 1418−1428. DOI: 10.1021/ma502281k

Curriculum Vitae

Name: **KEIJI TANAKA**

Date of Birth: January 21, 1970

Title: Professor

Affiliation: Kyushu University, Graduate School of Engineering,
Department of Applied Chemistry
744 Motooka, Nishi-ku, Fukuoka 819-0395, Japan

Telephone, Fax, E-mail, Website: TEL +81-92-802-2879, FAX +81-92-802-2880
k-tanaka@cstf.kyushu-u.ac.jp; http://www.cstf.kyushu-u.ac.jp/~tanaka-lab/

Education:

B.S.	Kyushu University, 1993
Ph.D.	Kyushu University, 1997
Postdoc	University of Wisconsin-Madison (Hyuk Yu), 1997 - 1999

Current Appointments:

Kyushu University, Professor (2009 - present)

Recent Awards:

2014	Japan Academy Medal Prize
2014	Japan Society for the Promotion of Science Prize
2014	The Society of Polymer Science, Japan, Wiley Award
2013	The Society of Fiber Science and Technology, Japan Award
2008	The Young Scientists' Prize, the Commendation for Science and Technology by the Minister of Education, Culture, Sports, Science and Technology

Research Interests:

Physical Properties of Polymers and Interfacial Engineering

Selected Representative Publications:

1. Sen, M.; Jiang, N.; Cheung, J.; Endoh, M. K.; Koga, T.; Kawaguchi, D.; Tanaka, K. "Flattening Process of Irreversibly Adsorbed Polymer Chains on A Solid", *ACS Macro Lett.* **2016**, *5(4)*, 504-508.
2. Ogata, Y.; Kawaguchi, D.; Tanaka, K. "The Impact of Polymer Dynamics on Photo-induced Carrier Formation in Films of Semiconducting Polymers", *J. Phys. Chem. Lett.* **2015**, *6(23)*, 4794-4798.
3. Inutsuka, M.; Horinouchi, A.; Tanaka, K. "Aggregation States of Polymers at Hydrophobic and Hydrophilic Sol-id Interfaces", *ACS Macro Lett.* **2015**, *4(10)*, 1174-1178.
4. Hirata, T.; Matsuno, H.; Kawaguchi, D.; Hirai, T.; Yamada, N. L.; Tanaka, M.; Tanaka, K. "Effect of Local Chain Dynamics on a Bio-inert Interface", *Langmuir* **2015**, *31(12)*, 3661-3667.
5. Ogata, Y.; Kawaguchi, D.; Tanaka, K. "An Effect of Molecular Motion on Carrier Formation in a Poly(3-hexylthiophene) Film", *Sci. Rep.* **2015**, *5*, 8436, 1-5.

Structure and Dynamics of Polymer Chains at Solid Interfaces

Keiji Tanaka

Department of Applied Chemistry
Graduate School of Engineering, Kyushu University
Nishi-ku, Fukuoka 819-0395, Japan
Email: k-tanaka@cstf.kyushu-u.ac.jp

Polymer composites including inorganic nano-fillers have been widely used in a variety of engineering fields. The performance and functionality of the composites are closely related to the quality of the interface between the polymer and the inorganic material. As the interaction between them is attractive and the interface is well defined, the fillers are dispersed homogeneously and thus the reinforcement is effective.

We have studied the local conformation of polystyrene (PS) in a film at the interface with an inorganic solid by sum-frequency generation (SFG) vibrational spectroscopy, and claimed that it is strongly dependent on the method of preparation of the film[1] in addition to the surface energy of the solid substrate.[2] It should be emphasized that the chain orientation at the interface was not well relaxed even at a temperature higher than the bulk glass transition temperature (T_g) unless the thermal annealing was applied for extremely longer than the bulk terminal relaxation time.[3] This finding is in good accordance with the idea of an interfacial dead layer in terms of mobility as well as our parallel claim that the T_g elevates in close proximity to the substrate interface.[4] This information should be of importance in the design of the interface in polymer composites.

To improve the interface affinity, reactive compounds such as silane coupling agents and ammonium salts have been applied for the surface treatment of silica fillers and crays, respectively. Introduction of functional groups to polymer chains is also effective. However, it is far from clear for the moment what happens with the polymer structure and the dynamics at the interface after such an interfacial modification. This may be a reason why perfect control of the interfacial interaction between the polymer and the inorganic material has not yet been attained.

We also characterize terminally-functionalized PS at an inorganic interface in thin film geometry, where the interfacial information is enhanced thanks to the large ratio of the interfacial area to the total volume.[5] This enables us to visualize polymer behavior at interfaces with inorganic solids and thus develop better strategies for the interfacial design of polymer composites.

References

1. Tsuruta, H.; Fujii, Y.; Kai, N.; Kataoka, H.; Ishizone, T.; Doi, M.; Morita, H.; Tanaka, K. *Macromolecules* **2012**, 45, 4643-4649.
2. Inutsuka, M.; Horinouchi, A.; Tanaka, K. *ACS Macro Lett*. **2015**, *4*, 1174-1178.
3. Sen, M.; Jiang, N.; Cheung, J.; Endoh, M. K.; Koga, T.; Kawaguchi, D.; Tanaka, K. *ACS Macro Lett*. **2016**, *5*, 504-508.
4. Tanaka, K.; Tateishi, Y.; Okada, Y.; Nagamura, T.; Doi, M.; Morita. H. *J. Phys. Chem. B*. **2009**, 113, 4571-4577.
5. Shimomura, S.; Inutsuka, M.; Tajima, K.; Nabika, M.; Moritomi, S.; Matsuno, H.; Tanaka, K. *Polymer J*. in press.

Curriculum Vitae

Name: **JEREMIAH A. JOHNSON**

Date of Birth: September 14, 1981

Title: Assistant Professor

Affiliation: MIT
Department of Chemistry
Cambridge, MA 02139, U.S.A.

Telephone, Fax, E-mail, Website: TEL +1-617-253-1819
jaj2109@mit.edu; web.mit.edu/johnsongroup/

Education:

B.S.	Washington University in St. Louis, 2004
Ph.D.	Columbia University, 2009
Postdoc	Caltech (Robert H. Grubbs and David A. Tirrell), 2009 - 2011

Current Appointments:
MIT, Firmenich Career Development Assistant Professor (2011 - present)

Recent Awards:

2016	Young Talent Award, China State Key Laboratory MEP-1
2014	NSF CAREER Award
2014	DuPont Young Professor Award
2014	3M Non-Tenured Faculty Award
2014	Air Force Young Investigator Award
2014	Sloan Research Fellowship

Research Interests:
Synthesis of polymers with controlled primary structures, nanostructured drug delivery agents with improved efficacy, and polymer networks with functions driven by molecular design

Selected Representative Publications:

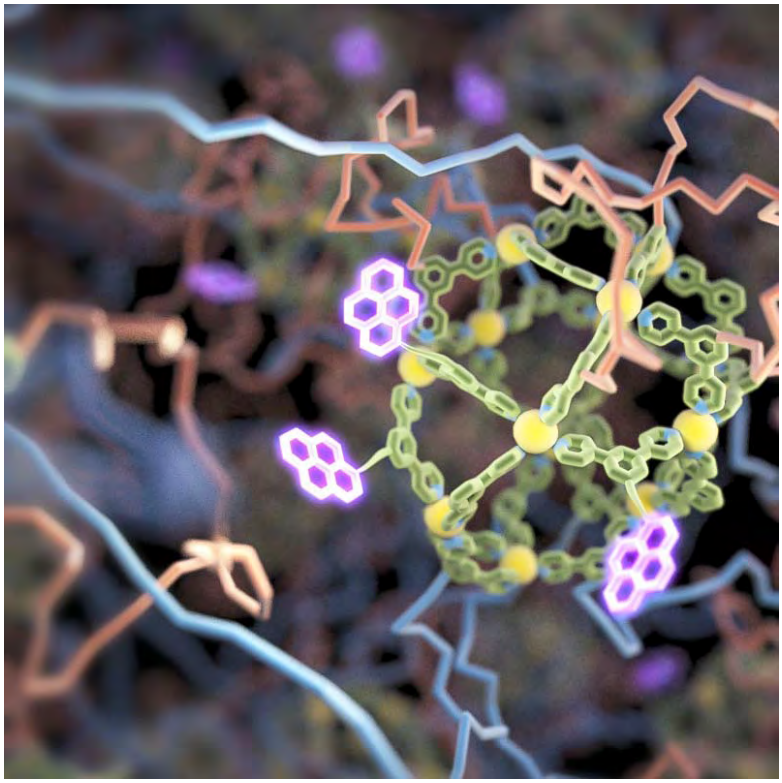
1. Zhukhovitskiy, A. V.; Zhong, M.; Keeler, E. G.; Michaelis, V. K.; Sun, J. E.P.; Hore, M. J. A.; Pochan, D. J.; Griffin, R. G.; Willard, A. P.; Johnson, J. A. "Highly branched and loop-rich gels via formation of metal-organic cages linked by polymers." *Nature Chem.* **2016**, *8*, 33-41.
2. Barnes, J. C.; Ehrlich, D. J. C.; Gao, A. X.; Leibfarth, F. A.; Jiang, Y.; Zhou, E.; Jamison, T. F.; Johnson, J. A. "Iterative exponential growth of stereo- and sequence-controlled polymers." *Nature Chem*. **2015**, *7*, 810-815.
3. Chen, M.; MacLeod, M. J.; Johnson, J. A. "Visible-light-controlled living radical polymerization from a trithiocarbonate iniferter mediated by an organic photo-redox catalyst." *ACS Macro Lett.* **2015**, *4*, 566-569.
4. Kawamoto, K.; Grindy, S. C.; Liu, J.; Holten-Andersen, N.; Johnson, J. A. "A dual role for 1,2,4,5-tetrazines in polymer networks: combining Diels-Alder reactions and metal coordination to generate functional supramolecular gels." *ACS Macro Lett.* **2015**, *4*, 458-461.
5. Chen, M.; Johnson, J. A. "Improving photo-controlled living radical polymerization from trithiocarbonates through the use of continuous-flow techniques." *Chem. Commun.* **2015**, *51*, 6742-6745.
6. Zhou, H.; Schoen, E. M.; Wang, M.; Liu, J.; Glassman, M.; Liu, J.; Díaz Díaz, D.; Olsen, B. D.; Johnson, J. A. "Crossover experiments applied to network formation reactions: improved strategies for counting elastically inactive molecular defects in PEG gels and hyperbranched polymers." *J. Am. Chem. Soc.* **2014**, *136*, 9464-9470.
7. Zhou, H.; Johnson, J. A. "Photo-controlled growth of telechelic polymers and end-linked polymer gels." *Angew. Chem. Int. Ed.* **2013**, *52*, 2235-2238.

Elasticity from a Molecular Perspective

Jeremiah A. Johnson

Department of Chemistry
MIT
Cambridge, MA, U.S.A.
Email: jaj2109@mit.edu

Polymer networks have found a broad range of applications in industry and fundamental research. Quantitative understanding of elasticity, one of the most important properties of a soft material, has been a long-term challenge in polymer networks due to their non-periodic, amorphous nature our lack of knowledge of inevitable topological defects in these materials.[1] This talk will describe our interests in using the tools of organic synthesis to study and control the molecular topology of covalent and supramolecular polymer networks. In particular, our development of *Network Disassembly Spectrometry* (NDS)[2] and related methods[3] has led to a new *Real Elastic Network Theory* (RENT) that bridges molecular and bulk properties of polymer networks for the first time.[4] Building from insights gained from NDS and RENT, we have developed new dynamic covalent[5] and supramolecular networks[6] that feature interesting mechanical behaviors.

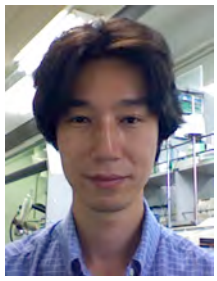


References

1. Rubinstein, M.; Colby, R. H. *Polymer Physics*; Oxford University Press, 2003.
2. Zhou, H.; Woo, J.; Cok, A. M.; Wang, M.; Olsen, B. D.; Johnson, J. A. *Proc. Natl. Acad. Sci. U. S. A.* **2012**, *109*, 19119.
3. (a) Zhou, H.; Schon, E.-M.; Wang, M.; Glassman, M. J.; Liu, J.; Zhong, M.; Diaz Diaz, D.; Olsen, B. D.; Johnson, J. A. *J. Am. Chem. Soc.* **2014**, *136*, 9464; (b) Kawamoto, K.; Zhong, M.; Wang, R.; Olsen, B. D.; Johnson, J. A. *Macromolecules* **2015**, *48*, 8980.
4. Zhong, M.; Kawamoto, K.; Wang, R.; Olsen, B. D.; Johnson, J. A. *submitted* **2016**
5. Zhou, H.; Johnson, J. A. *Angew. Chem., Int. Ed.* **2013**, *52*, 2235.

(1) Rubinstein, M.; Colby, R. H. *Polymer Physics*; Oxford University Press, 2003.
(2) Zhou, H.; Woo, J.; Cok, A. M.; Wang, M.; Olsen, B. D.; Johnson, J. A. *Proc. Natl. Acad. Sci. U. S. A.* **2012**, *109*, 19119.
(3) (a) Zhou, H.; Schon, E.-M.; Wang, M.; Glassman, M. J.; Liu, J.; Zhong, M.; Diaz Diaz, D.; Olsen, B. D.; Johnson, J. A. *J. Am. Chem. Soc.* **2014**, *136*, 9464; (b) Kawamoto, K.; Zhong, M.; Wang, R.; Olsen, B. D.; Johnson, J. A. *Macromolecules* **2015**, *48*, 8980.
(4) Zhong, M.; Kawamoto, K.; Wang, R.; Olsen, B. D.; Johnson, J. A. *submitted* **2016**
(5) Zhou, H.; Johnson, J. A. *Angew. Chem., Int. Ed.* **2013**, *52*, 2235.
(6) Zhukhovitskiy, A. V.; Zhong, M.; Keeler, E. G.; Michaelis, V. K.; Sun, J. E. P.; Hore, M. J. A.; Pochan, D. J.; Griffin, R. G.; Willard, A. P.; Johnson, J. A. *Nature Chem.* **2016**, *8*, 33.

Curriculum Vitae



Name: **YASUHIRO ISHIDA**

Date of Birth: March 6, 1974

Title: Team Leader

Affiliation: RIKEN Center for Emergent Matter Science
2-1 Hirosawa, Wako, Saitama 351–0198, Japan

Telephone, Fax, E-mail, Website: TEL +81-48-462-1111 ext. 6351, FAX +81-48-462-8214
y-ishida@riken.jp; http://www.cems.riken.jp/en/laboratory/ebsmrt

Education:

B.A.	Osaka University, 1982
Ph.D.	Osaka University, 1988
Postdoc	University of Massachusetts at Amherst (David A. Tirrell), 1988 - 1989

Current Appointments:

RIKEN, Team Leader (2009 - present)

Recent Awards:

2006 Symposium Molecular Chirality 2006, Presentation Award
2004 The Association for the Progress of New Chemistry, Research Encouragement Award

Research Interests:

Materials Science, Macroscopically Oriented Soft Materials Based on Magnetically Ordered Colloids and Liquid Crystals.

Selected Representative Publications:

1. Matsui, R.; Ohtani, M.; Yamada, K.; Hikima, T.; Takata, M.; Nakamura, T.; Koshino, H.; Ishida, Y.; Aida, T. "Chemically Locked Bicelles with High Thermal and Kinetic Stability" *Angew. Chem. Int. Ed.* **2015**, *54,* 13284-13288.
2. Li, C.; Cho, J.; Yamada, K.; Hashizume, D.; Araoka, F.; Takezoe, H.; Aida, T.; Ishida, Y. "Macroscopic Ordering of Helical Pores for Arraying Guest Molecules Noncentrosymmetrically" *Nature Commun.* **2015**, *6*, 8418.
3. Kim, Y. S.; Liu, M.; Ishida, Y.; Ebina, Y.; Osada, M.; Sasaki, T.; Hikima, T.; Takata, M.; Aida, T. "Thermoresponsive Actuation Enabled by Permittivity Switching in an Electrostatically Anisotropic Hydrogel" *Nature Mater.* **2015**, *14*, 1002-1007.
4. Liu, M.; Ishida, Y.; Ebina, Y.; Sasaki, T.; Hikima, T.; Takata, M.; Aida, T. "An Anisotropic Hydrogel with Electrostatic Repulsion between Cofacially Aligned Nanosheets" *Nature* **2015**, *517*, 68-72.
5. Liu, M.; Ishida, Y.; Ebina, Y.; Sasaki, T.; Aida, T. "Photolatently Modulable Hydrogels Using Unilamellar Titania Nanosheets as Photocatalytic Crosslinker" *Nature Commun.* **2013**, *4*, 2029.
6. Ishida, Y.; Matsuoka, Y.; Kai, Y.; Yamada, K.; Nakagawa, K.; Asahi, T.; Saigo, K. "Metastable Liquid Crystal as Time-Responsive Reaction Medium: Aging-Induced Dual Enantioselective Control" *J. Am. Chem. Soc.* **2013***, 135*, 6407-6410.

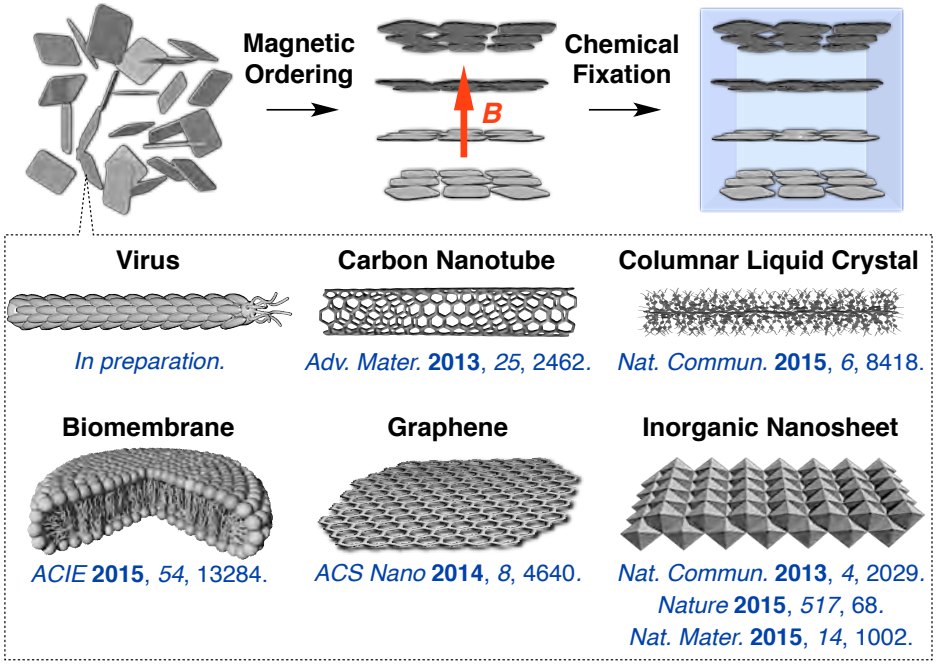
Single-crystal-like Soft Materials: Magnetic Orientation of Three-dimensional Polymer Networks

Yasuhiro Ishida

RIKEN Center for Emergent Matter Science
2-1 Hirosawa, Wako, Saitama 351-0198, Japan
Email: y-ishida@riken.jp

Owing to its remarkable progress over the last two decades, supramolecular chemistry has become a promising tool to construct and fabricate various nanoscopic architectures. A remaining challenge is how to assemble these nanoscopic architectures into a hierarchically ordered structure that extends over a macroscopic size regime. For this aim, magnetic structural ordering is highly attractive, which allows for the orientation of 1D- and 2D-shaped nanoobjects in non-contact and non-destructive manners. Although such magneto-induced orientation is prone to undergo thermal relaxation, in-situ crosslinking reactions enable the oriented structures to endure even in the absence of a magnetic field.

Based on this concept, we recently developed polymer networks with 'single-crystal-like' structural order, where various kinds of 1D and 2D-shaped nanoobjects were employed as constituents (Figure 1).[1–9] Their unprecedented functions originating from anisotropic structures will be discussed in this presentation.



References

1. Maggini, L. *et al. Adv. Mater.* **2013**, *25*, 2462–2467.
2. Liu, M. *et al. Nature Commun.* **2013**, *4*, 2029.
3. Tamesue, S. *et al. J. Am. Chem. Soc.* **2013**, *135*, 5650–5655.
4. Ishida, Y. *et al. J. Am. Chem. Soc.* **2013**, *135*, 6407–6410.
5. Wu, L. *et al. ACS Nano* **2014**, *8*, 4640–4649.
6. Liu, M. *et al*. *Nature* **2015**, *517*, 68–72.
7. Kim, Y. S. *et al. Nature Mater.* **2015**, *14*, 1002–1007.
8. Matsui, R. *et al. Angew. Chem. Int. Ed.* **2015**, *54*,13284–13288.
9. Li, C. *et al. Nature Commun.* **2015**, *6*, 8418.

Curriculum Vitae

Name: **Timothy M. Swager**

Date of Birth: July 1, 1961

Title: Professor

Affiliation: Massachusetts Institute of Technology,
Department of Chemistry, Cambridge MA

Telephone, E-mail, Website: TEL +1-617-253-4423, tswager@mit.edu
http://chemistry.mit.edu/people/swager-timothy

Education:

B.A.	Montana State University, 1983
Ph.D.	California Institute of Technology (Robert H. Grubbs) 1988
Postdoc	Massachusetts Institute of Technology (Mark S. Wrighton), 1988 - 1990

Current Appointments:

Massachusetts Institute of Technology
Professor of Chemistry, July 1, 1996-present
John D. MacArthur Professor of Chemistry, July 1, 2005-present
Director of the Deshpande Center for Technological Innovation, May 1, 2014-Present

Recent Awards:

2014	Humboldt Research Award
2013	Fellow of the American Chemical Society
2009	Fellow of the Division of Polymer Chemistry (ACS
2008	Elected to the National Academy of Sciences
2008	Honorary Doctorate of Science, Montana State University

Research Interests:

Polymers, Sensors, Liquid Crystals, Organic Electronic Materials, Photophysics, Energy Conversion Materials, Synthesis, Electrochemistry, Dynamic Nuclear Polarization

Selected Representative Publications:

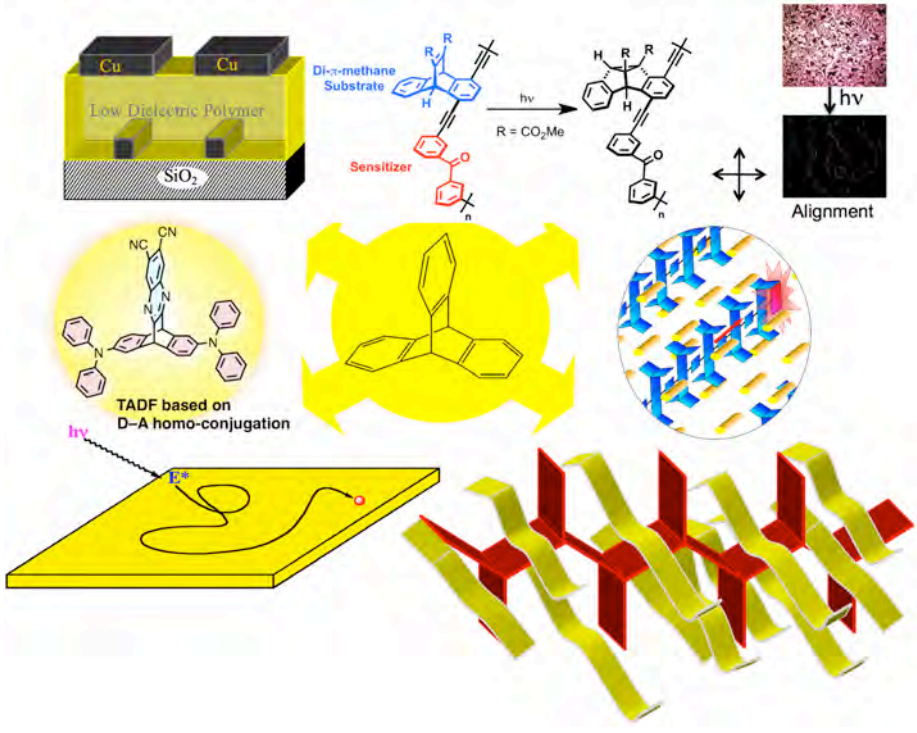
1. Weis, J. G.; Ravnsbæk, J. B.; Mirica, K. A.; Swager. T. M. "Employing Halogen Bonding Interactions in Chemiresistive Gas Sensors" *ACS Sensors* **2016**, *1*, 115-119.
2. Fennell, J. F.; Liu, S. F.; Azzarelli, J. M.; Weis, J. G.; Rochat, S.; Mirica, K. A.; Ravnsbæk J. B. "Nanowire Chemical/Biological Sensors: Status and a Roadmap for the Future" *Angew. Chem. Int. Ed.* **2016**, *55*, 1266-1281.
3. Zhao, Y.; Chen, L.; Swager, T. M. "Simultaneous Identification of Neutral and Anionic Species in Complex Mixtures without Separation" *Angew. Chem. Int. Ed.* **2016**, *55,* 917-921.
4. Belger, C.; Weis, J. G.; Ahmed, E.; Swager, T. M. "Colorimetric Stimuli-Responsive Hydrogel Polymers for the Detection of Nerve Agents" *Macromolecules* **2015**, *48*, 7990-7994.
5. Gutierrez, G. D.; Coropceanu, I.; Bawendi, M. G.; Swager, T. M. "A Low Reabsorbing Luminescent Solar Concentrator Employing π-Conjugated Polymers" *Adv. Mater.* **2015**, *28*, 497-501.
6. Kalow, J. A.; Swager, T. M. "Synthesis of Miktoarm Branched Conjugated Copolymers by ROMPing In and Out" *ACS MarcoLett* **2015**, *4*, 1229-1233.
7. Zarzar, L. D.; Sresht, V.; Sletten, E. M.; Kalow, J. A.; Blankschtein, D.; Swager, T. M. "Dynamically Reconfigurable Complex Emulsions via Tunable Interfacial Tensions" *Nature*, **2015**, *518*, 520-524.
8. Ravnsbaek, J. B.; Swager, T. M. "Mechanochemical Synthesis of Poly(phenylene vinylenes)" *ACS MacroLett*. **2014**, *3*, 305-309.
9. Cox, J. R.; Simpson, J. H.; Swager, T. M. "Photoalignment Layers for Liquid Crystals from the Di-π-Methane Rearrangement" *J. Am. Chem. Soc*. **2013**, *135*, 640-643.
10. Sydlik, S. A.; Swager, T. M. "Functional Graphenic Materials via a Johnson-Claisen Rearrangement" *Adv. Mater.* **2013**, *23*, 1873-1882.

Polymers with Iptycenes and Related Structures

Timothy M. Swager

Department of Chemistry
Massachusetts Institute of Technology
77 Massachusetts Ave., Cambridge MA, 02139, USA
Email: tswager@mit.edu

I have had a long fascination with the molecule triptycene and the range of properties that can be imparted by these rigid 3D structures is simply remarkable. Beyond their initial utility in preventing self-quenching in emissive semiconducting polymers for chemical sensors, we have found that they can guide and enhance alignment to liquid crystals, produce high modulus low dielectric constant materials, functional as gas permeable materials, simultaneously give dramatic increases in strength and ductility of polymers, and provide for novel electronic interactions. In this lecture I will detail our most recent triptycene polymer efforts: (1) post-polymerization functionalization to give materials with proton conductivities higher than nafion for use in fuel cells, (2) scalable mechanochemical synthesis of materials that behave as chemical sponges for aromatic molecules, (3) polymerization of shape persistent iptycene macromonomers to produce high free volume materials, (4) polymers and molecules with electronically active elements that communicate by homo-conjugation to give thermally activated delayed fluorescence.



References:

1. Swager, T. M. "Iptycenes in the Design of High Performance Polymers" *Acc. Chem. Res.* **2008**, *41*, 1181-1189.
2. Sydlik, S. A.; Chen, Z.; Swager, T. M. "Triptycene Polyimides: Soluble Polymers with High Thermal Stability and Low Refractive Indices" *Macromolecules*, **2011**, *44*, 976-980.
3. Kawazumi, K.; Wu. T.; Chae, H. S.; Van Voorhis, T.; Baldo M. A.; Swager, T. M. "Thermally Activated Delayed Fluorescence Materials Based on Homo-conjugation Effect of Donor-acceptor Triptycenes" *J. Am. Chem. Soc.* **2015** *137*, 11908–11911.

Curriculum Vitae

Name: **KENICHIRO ITAMI**

Date of Birth: April 4, 1971

Title: Professor

Affiliation: Nagoya University, Institute of Transformative Bio-Molecules (ITbM), Chikusa, Nagoya 464-8602, Japan

JST-ERATO, Itami Molecular Nanocarbon Project

Telephone, Fax, E-mail, Website: TEL/FAX +81-52-788-6098
itami@chem.nagoya-u.ac.jp; http://synth.chem.nagoya-u.ac.jp/wordpress/?lang=en

Education: B.A. Kyoto University, 1994
Ph.D. Kyoto University, 1998

Current Appointments:

Nagoya University, Professor (2008 - present), Director of ITbM (2012 - present)
JST-ERATO, Research Director (2013 - present)

Recent Awards:

Ta-Shue Chou Lectureship Award, Academia Sinica (2016), R. C. Fuson Visiting Professor, University of Illinois at Urbana-Champaign (2015), Arthur C. Cope Scholar Award, American Chemical Society (2015), Swiss Chemical Society Lectureship Award (2015), Nankai University Lectureship Award (2014), The Aldrich Lectureship Award, Emory University (2014), The JSPS Prize (2014), Novartis Chemistry Lectureship Award (2013), Mukaiyama Award (2013), Fellow of the Royal Society of Chemistry, UK (2012), German Innovation Award (2012), Novartis-MIT Lectureship Award, (2012), Merck-Banyu Lectureship Award (2008), Minister's Award for Distinguished Young Scientists, MEXT (2006), Mitsui Chemicals Catalysis Science Award of Encouragement (2005)

Research Interests:

Synthetic chemistry; C-H Functionalization; Molecular nanocarbon; Medicinal chemistry; Plant chemical biology; Chemical chronobiology

Selected Representative Publications:

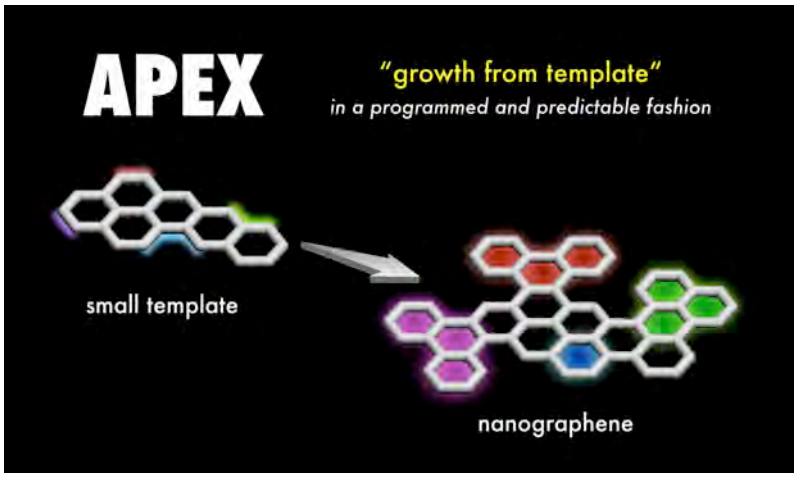
1. Y. Segawa *et al.* "Structurally uniform and atomically precise carbon nanostructures" *Nature Rev. Mater.* **2016**, *1*, 15002.
2. Y. Tsuchiya *et al.* "Probing strigolactone receptors in *Striga hermonthica* with fluorescence" *Science* **2015**, *349*, 864.
3. K. Muto *et al.* "Decarbonylative organoboron cross-coupling of esters by nickel catalysis" *Nature Commun.* **2015**, *6*, 7508.
4. K. Ozaki *et al.* "One-shot K-region-selective annulative π -extension for nanographene synthesis and functionalization" *Nature Commun.* **2015**, *6*, 6251.
5. S. Suzuki *et al.* "Synthesis and characterization of hexaarylbenzenes with five or six different substituents enabled by programmed synthesis" *Nature Chem.* **2015**, *7*, 227.
6. K. Kawasumi *et al.* "A grossly warped nanographene and the consequences of multiple odd-membered-ring defects" *Nature Chem.* **2013**, *5*, 739.
7. H. Omachi *et al.* "Initiation of carbon nanotube growth by well-defined carbon nanorings" *Nature Chem.* **2013**, *5*, 572.

APEX: A New Way to Rapidly Synthesize Nanographenes and a New Form of Carbon

Kenichiro Itami

Institute of Transformative Bio-Molecules (ITbM), Nagoya University
JST-ERATO, Itami Molecular Nanocarbon Project,
Chikusa, Nagoya 464-8602, Japan
Email: itami@chem.nagoya-u.ac.jp

The design and synthesis of nanocarbons as structurally well-defined molecules are one of the core projects in our group. For example, we have contributed to the bottom-up, controlled synthesis of structurally uniform nanographenes. Our simple yet powerful palladium catalyst [$Pd(OAc)_2$/*o*-chloranil] can catalyze the regioselective aromatic π-extension (APEX) of polycyclic aromatic hydrocarbon. This methodology can be applied to various planar and geodesic PAHs and the controlled synthesis of nanographenes is becoming realistic. In addition to the controlled synthesis of CNTs (1D nanocarbons) and graphene nanoribbons (1D/2D nanocarbons), we created completely novel, 3D curved nanocarbons. We accomplished the synthesis of a novel warped nanographene that contains both positive and negative curvatures on its π -surface. These warped nanographenes have an uneven structure that is unique and clearly distinct from any other nanocarbon synthesized so far, and are expected to possess unprecedented functions.



References

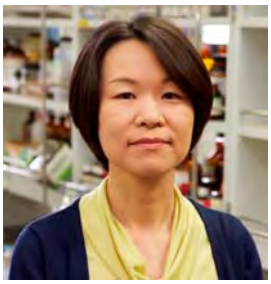
1. K. Mochida *et al.* "Direct arylation of polycyclic aromatic hydrocarbons through palladium catalysis" *J. Am. Chem. Soc.* **2011**, *133*, 10716.
2. K. Kawasumi *et al.* "$Pd(OAc)_2$/*o*-chloranil/$M(OTf)_n$: a catalyst for the direct C-H arylation of polycyclic aromatic hydrocarbons with boryl-, silyl-, and unfunctionalized arenes" *Org. Lett.* **2012**, *14*, 418.
3. Q. Zhang *et al.* "Palladium-catalyzed C-H activation taken to the limit. Flattening an aromatic bowl by total arylation" *J. Am. Chem. Soc.* **2012**, *134*, 15664.
4. K. Kawasumi *et al.* "A grossly warped nanographene and the consequences of multiple odd-membered-ring defects" *Nature Chem.* **2013**, *5*, 739.
5. K. Ozaki *et al.* "One-shot K-region-selective annulative π -extension for nanographene synthesis and functionalization" *Nature Commun.* **2015**, *6*, 6251.
6. Y. Segawa *et al.* "Synthesis of extended π-systems through C-H activation" *Angew. Chem. Int. Ed.* **2015**, *54*, 159.
7. Y. Segawa *et al.* "Structurally uniform and atomically precise carbon nanostructures" *Nature Rev. Mater.* **2016**, *1*, 15002.

DAY FIVE

(Tuesday, June 28)

CURRICULA VITAE AND
ABSTRACTS

Curriculum Vitae



Name: **Eriko Sato**

Date of Birth: September 18, 1977

Title: Lecturer

Affiliation: Osaka City University, Graduate School of Engineering,
Department of Applied Chemistry and Bioengineering
3-3-138 Sugimoto, Sumiyoshi-ku, Osaka 558-8585, Japan

Telephone, Fax, E-mail, Website: TEL +81-6-6605-2982, FAX +81-6-6605-2982
sato@a-chem.eng.osaka-cu.ac.jp;
http://www.a-chem.eng.osaka-cu.ac.jp/polymer/index.html

Education: B.A. Osaka City University, 2000
Visiting Research Associate
Griffith University (Prof. Ken Busfield), 2000.10-2001.2 and 2002.4-7
Ph.D. Osaka City University, 2004
Postdoc Hokkaido University (Prof. Masayoshi Tabata), 2004
Tohoku University (Prof. Tokuji Miyashita), 2005
Kinki University (Prof. Takeshi Endo), 2006-2007

Current Appointments:

Osaka City University, Lecturer (2011- present)
IUPAC subcommittee on Modeling of Polymerization Kinetics and Processes (2010 - present)

Recent Awards:

2013 Award for Encouragement of Research in Polymer Science, the Society of Polymer Science, Japan
2013 IUPAC International Symposium on Ionic Polymerization, Best Presentation Award for Rising Star
2013 President's Incentive Award of Osaka City University
2011 Incentive Award of the Adhesion Society of Japan
2010 The Chemical Society of Japan Presentation Award
2009 The Third Asian Conference on Adhesion, Best Poster Award

Research Interests:

Synthesis of Reactive Polymer, Interfacial Chemistry, Functional Adhesion

Selected Representative Publications:

1. E. Sato*, M. Yuri, S. Fujii, T. Nishiyama, Y. Nakamura and H. Horibe, "Liquid marbles as a micro-reactor for efficient radical alternating copolymerization of diene monomer and oxygen", *Chem. Commun.*, **51**, 17241-17244 (2015).
2. E. Sato*, Y. Masuda, J. Kadota, T. Nishiyama, H. Horibe, "Dual Stimuli-Responsive Homopolymers: Thermo- and Photo-responsive Properties of Coumarin-Containing Polymers in Organic Solvents", *Eur. Polym. J.,* **69**, 605-615 (2015).
3. E. Sato*, I. Uehara, H. Horibe, and A. Matsumoto, "One-Step Synthesis of Thermally Curable Hyperbranched Polymers by Addition-Fragmentation Chain Transfer Using Divinyl Monomers", *Macromolecules*, **47**(3), 937-943 (2014).
4. E. Sato*, T. Hagihara, and A. Matsumoto, "Facile Synthesis of Main-Chain Degradable Block Copolymers for Performance Enhanced Dismantlable Adhesion", *ACS Appl. Mater. Interfaces*, **4**(4), 2057-2064 (2012).

Design and Precise Synthesis of Reactive Polymers and Their Application to Functional Adhesive Materials

Eriko SATO

Department of Applied Chemistry and Bioengineering
Graduate School of Engineering, Osaka City University
3-3-138 Sugimoto, Sumiyoshi-ku, Osaka 558-8585, Japan
Email: sato@a-chem.eng.osaka-cu.ac.jp

The mechanism of adhesion is a complex science including interfacial chemistry and bulk properties of polymers used for adhesive materials (Figure 1), although an adhesion technology is a classical technology. Reactive polymers have attracted much attention, in particular polymer reactions proceed at gelled or solid state are useful for the design of functional materials, which are often used at gelled or solid state and not in solution. Polymer reactions result in property changes such as a polarity and mechanical strength, which significantly influence adhesion properties, and thus the introduction of reactive moieties to adhesive polymers allows to manipulate the adhesion properties. In this presentation, the requirements for the adhesive materials are first addressed, and the precise synthesis of reactive polymers including block copolymers and hyperbranched polymers (Figure 2) and their application to functional adhesive materials such as dismantlable (de-bondable) adhesives are delivered.[1-4]

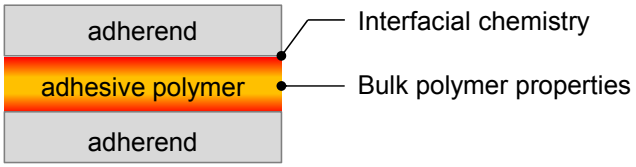


Figure 1. Factors affecting adhesion properties.

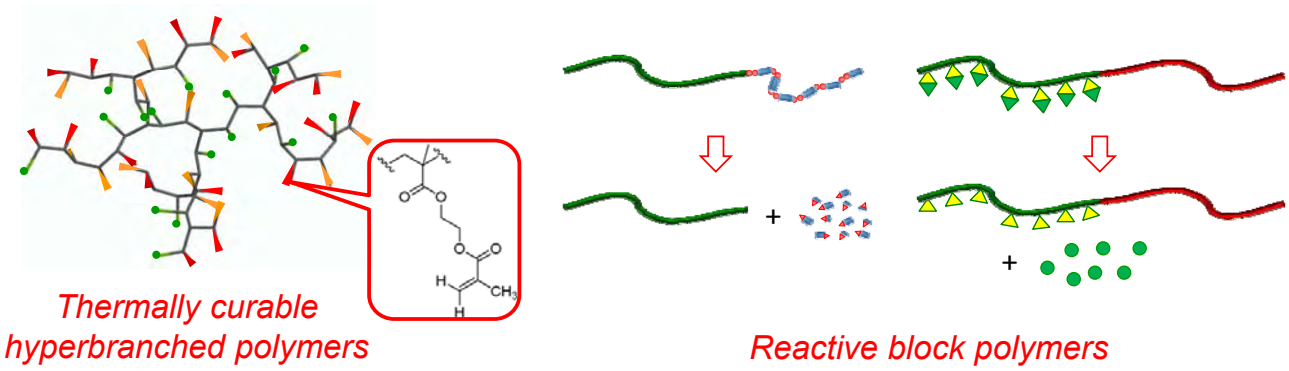


Figure 2. Reactive hyperbranched and block copolymers.

References

1. E. Sato, H. Tamura, and A. Matsumoto, *ACS Appl. Mater. Interfaces*, **2**(9), 2594-2601 (2010). E. Sato, T. Hagihara, and A. Matsumoto, *ACS Appl. Mater. Interfaces*, **4**(4), 2057-2064 (2012).
2. T. Inui, E. Sato, A. Matsumoto, *ACS Appl. Mater. Interfaces*, **4**(4), 2124-2132 (2012). T. Inui, K. Yamanishi, E. Sato, and A. Matsumoto, *Macromolecules*, **46**(20), 8111-8120 (2013). E. Sato, K. Yamanishi, T. Inui, H. Horibe, and A. Matsumoto, *Polymer*, **64**, 260-267 (2015).
3. E. Sato, I. Uehara, H. Horibe, and A. Matsumoto, *Macromolecules*, **47**(3), 937-943 (2014).
4. E. Sato, M. Yuri, S. Fujii, T. Nishiyama, Y. Nakamura and H. Horibe, *Chem. Commun.*, **51**, 17241-17244 (2015).

Curriculum Vitae

Name: **Brett P. Fors**

Date of Birth: June 5, 1983

Title: Assistant Professor

Affiliation: Cornell University
Department of Chemistry and Chemical Biology
Ithaca, NY 14853, USA

Telephone, E-mail, Website: TEL +1-607-254-1487
bp46@cornell.edu; http://fors.chem.cornell.edu

Education:

B.S.	Montana State University, 2006
Ph.D.	Massachusetts Institute of Technology, 2011
Postdoc	University of California, Santa Barbara (Craig J. Hawker), 2011 - 2014

Current Appointments:
Cornell University, Assistant Professor (2014 - present)

Recent Awards:

2017	ACS PMSE Young Investigator
2016	3M Non-Tenured Faculty Award
2015	PolyChar Bruce Hartman Young Investigator Prize
2014	Thieme Chemistry Journal Award
2011	Elings Fellowship in Experimental Science
2010	ACS Organic Division Fellowship

Research Interests:
Photoregulated Polymerizations, Synthesis and Investigation of Polymers with Controlled Molecular Weight Distributions, Design and Synthesis of Polymeric Electronic Materials

Selected Representative Publications:

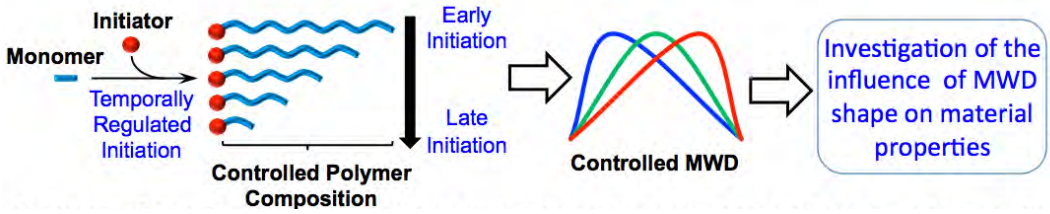
1. Veronika Kottisch, Dillon T. Gentekos, Brett P. Fors *"Shaping the Future of Molecular Weight Distributions in Anionic Polymerization"* Submitted.
2. Dillon T. Gentekos, Lauren N. Dupuis, Brett P. Fors *"Beyond Dispersity: Deterministic Control of Polymer Molecular Weight Distributions" J. Am. Chem. Soc.* **2016**, *138*, 1848.
3. Jacob T. Trotta, Brett P. Fors *"Organic Catalysts for Photocontrolled Polymerizations" Synlett* **2016**, *27*, 702.
4. Joe Collins, Zehun Xiao, Andrea Espinosa-Gomez, Brett P. Fors, Luke A. Connal *"Extremely Rapid and Versatile Synthesis of High Molecular Weight Step Growth Polymers via Oxime Click Chemistry" Polym. Chem.* **2016**, *7*, 2581.
5. You-Chi Mason Wu, Michel F. Molaire, David S. Weiss, Felipe A. Angel, Catherine R. DeBlase, Brett P. Fors *"Synthesis of Amorphous Monomeric Glass Mixtures for Organic Electronic Applications" J. Org. Chem.*, ***2015**, 80*, 12740.
6. Nicolas J. Treat, Hazel Sprafke, John W. Kramer, Paul G. Clark, Bryan E. Barton, Javier Read de Alaniz, Brett P. Fors, Craig J. Hawker *"Metal-Free Atom Transfer Radical Polymerization" J. Am. Chem. Soc.* **2014**, *136*, 16096.

Shaping the Future of Polymer Molecular Weight Distributions

Brett P. Fors

Department of Chemistry and Chemical Biology
Cornell University
Ithaca, NY 14853, USA
Email: bpf46@cornell.edu

A polymer's molecular weight distribution (MWD) has a profound impact on its properties, from material strength and viscosity to changes in the phase behavior of block copolymers.[1-3] Dispersity is the most common measure of MWD and is described as the ratio of weight-average (M_w) to number-average (M_n) molecular weights. Importantly, dispersity only provides information on the relative breadth of molecular weights in a sample and is not a comprehensive description of the molar quantities of each chain size.[2] The exact shape of a MWD has been proposed to have a strong influence on polymer properties;[5,6] however, this hypothesis remains relatively unexplored. This presentation will detail the development of a modular synthetic strategy that provides deterministic control over the M_n, breadth, and composition of polymer MWDs and will examine the influence of MWD shape on polymer properties.[7]



References

1. Nichetti, D.; Manas-Zloczower, I. *Polym. Eng. Sci.* **1999**, *39*, 887–895.
2. Collis, M. W.; Mackley, M. R. *J. Non-Newtonian Fluid Mech.* **2005**, *128*, 29–41.
3. Lynd, N. A.; Meuler, A. J.; Hillmyer, M. A. *Prog. Polym. Sci.* **2008**, *33*, 875–893.
4. S. S. Rane and P. Choi, *Chem. Mater.*, 2005, **17**, 926–926.
5. Lynd, N. A.; Hillmyer, M. A.; Matsen, M. W. *Macromolecules* **2008**, *41*, 4531–4533.
6. Cooke, D. M.; Shi, A.-C. *Macromolecules* **2006**, *39*, 6661–6671.
7. Gentekos, D. T.; Dupuis, L. N.; Fors, B. P. *J. Am. Chem. Soc.* **2016**, *138*, 1848–1851.

Curriculum Vitae

Name: **ITARU HAMACHI**

Date of Birth: June 14, 1960

Title: Professor

Affiliation: Kyoto University, Graduate School of Engineering,
Department of Synthetic Chemistry and Biological Chemistry
Nishikyo-ku, Kyoto 615-8510, Japan

Telephone, Fax, E-mail, Website: TEL +81-75-383-2754, FAX +81-75-383-2759
ihamachi@sbchem.kyoto-u.ac.jp; http://www.sbchem.kyoto-u.ac.jp/hamachi-lab/

Education: B.A. Kyoto University, 1983
Ph.D. Kyoto University, 1988
Exchange Grad Student: University of North Carolina at Chapel Hill (Tom. Meyer), 1985

Current Appointments:
Kyoto University, Professor (2005 - present)
CREST (nanostructure, molecular technology) investigator, JST (2008 - present)
PREST (single cell analysis) supervisor, JST (2014 - present)

Recent Awards:
2014 Nagoya Silver Medal
2011 Fellow of the Royal Society of Chemistry
2005 The Chemical Society of Japan Award for Creative Work

Research Interests:
Chemical Biology, Live Cell Organic Chemistry, Supramolecular Materials

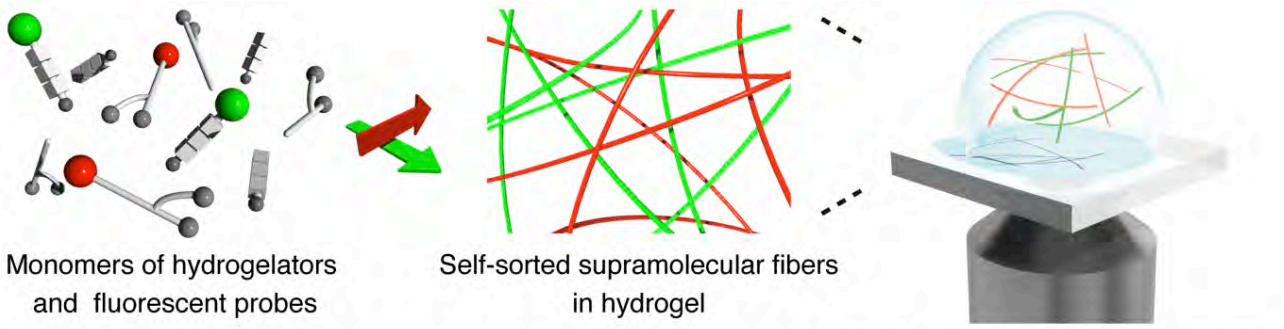
Selected Representative Publications:
1. Onogi, S.; Shigemitsu, H.; Yoshii, T.; Tanida, T.; Ikeda, M.; Kubota, R.; Hamachi, I. " *In-situ* Real Time Imaging of Self-sorted Supramolecular Fibers " *Nat. Chem.* **2016**, *in press*.
2. Kiyonaka, S.; Kubota, R.; Michibata, Y.; Sakakura, M.; Takahashi, H.; Numata, T.; Inoue, R.; Yuzaki, M.; Hamachi, I. "Allosteric Activation of Glutamate Receptors by On-cell Coordination Chemistry" *Nat. Chem.* **2016**, *in press*.
3. Ikeda, M.; Tanida, T.; Yoshii, T.; Kurotani, K.; Onogi, S.; Urayama, K.; Hamachi, I. "Installing Logic-gate Responses to a Variety of Biological Substances in Supremolecular Hydrogel-enzyme Hybrids" *Nat. Chem.* **2014**, *6*, 511-518.
4. Tsukiji, S.; Miyagawa, M.; Takaoka, Y.; Tamura, T.; Hamachi, I. "Ligand-directed Tosyl Chemistry for Protein Labeling in Vivo" *Nat. ChemBio.* **2009**, *5*, 341-343.
5. Takaoka, Y.; Sakamoto, T.; Tsukiji, S.; Narazaki, M.; Matsuda, T.; Tochio, H.; Shirawaka, M.; Hamachi, I. "Self-assembling Nano-probes Displaying Off/On 19F NMR Signals for Protein Detection and Imaging" *Nat. Chem.* **2009**, *1*, 557-561.

Real Time Imaging of Orthogonally Self-assembled Fibers

Itaru Hamachi

Department of Synthetic Chemistry and Biological Chemistry
Graduate School of Engineering, Kyoto University
Nishikyo-ku, Kyoto 615-8510, Japan
Email: ihamachi@sbchem.kyoto-u.ac.jp

Self-sorting event is ubiquitous in living systemrs and it should be one of the crucial factors for their dynamic and flexible functions. Therefore, it is recently considered that self-sorted supramolecular assemblies such as supramolecular nanofibers are invaluable for complex but well-organized systems with sophisticated functions like living cells. To design and control the self-sorting events in synthetic materials, understanding their structures and dynamics in detail is indispensable. I herein describe *in situ* real-time imaging of self-sorted supramolecular nanofibers consisting of a peptide gelator and an amphiphilic phosphate by using confocal laser scanning microscopy and super resolution imaging. Design of orthogonal supramolecular fibers together with appropriate fluorescent probes allowed us to visualize the self-sorted fibers entangled in 2D and 3D in the hydrogel state with 80 nm resolution. *In situ* time-lapse imaging unveiled that the physicochemical properties remained intact in the orthogonal fibers and that there is a remarkable difference in the fiber formation rate between the two fibers. Moreover, we directly visualized the stochastic non-synchronous fiber formation with the cooperative mechanism in real-time, which cannot be detected by conventional techniques



References

1. Onogi, S.; Shigemitsu, H.; Yoshii, T.; Tanida, T.; Ikeda, M.; Kubota, R.; Hamachi, I. *Nat. Chem.* **2016**, *in press*.
2. Yoshii, T.; Onogi, S.; Shigemitsu, H., Hamachi, I. *J, Am, Chem. Soc.,* **2015**, *137*, 3360-3365.
3. Ikeda, M.; Tanida, T.; Yoshii, T.; Kurotani, K.; Onogi, S.; Urayama, K.; Hamachi, I. *Nat. Chem.* **2014**, *6*, 511-518.
4. Tamaru, S.; Ikada, M.; Shimidzu, Y.; Matsumoto, S.; Takeuchi, S. Hamachi, I. *Nat. Commun.* **2010**, *1*, DOI: 10.1038/ncomms1018..
5. Kiyonaka, S.; Sada, K.; Yoshimura, I.; Shinkai, S.; Kato, N.; Hamachi, I. *Nat. Mat.* **2004**, *3*, 57-64.

Curriculum Vitae

Name: **MARGARITA HERRERA-ALONSO**

Date of Birth: September 16, 1973

Title: Assistant Professor

Affiliation: Johns Hopkins University,
Department of Materials Science and Engineering
Baltimore, MA 21218, USA

Telephone, Fax, E-mail, Website: TEL +1-410-516-5592, FAX +1-410-516-5293
herrera@jhu.edu; http:// http://engineering.jhu.edu/herrera/

Education:

B.S.	Universidad Nacional Autonoma de Mexico, 1999
Ph.D.	University of Massachusetts at Amherst (Tom McCarthy), 2004
Postdoc	Princeton University (Robert Prud'homme), 2004 - 2007

Current Appointments:

Johns Hopkins University, Assistant Professor (2010 - present)

Recent Awards:

2012	CAREER Award, National Science Foundation
2008	CONACyT Postdoctoral Fellowship, Consejo Nacional de Ciencia y Tecnologia
1999	Fulbright/Garcia-Robles Scholarship, Institute of International Education
1997	CONACyT Postdoctoral Fellowship, Consejo Nacional de Ciencia y Tecnologia

Research Interests:

Molecular and Process Determinants of Solution Based Polymer Assembly, Brush Copolymers, Environmentally Responsive Polymers, Drug Delivery

Selected Representative Publications:

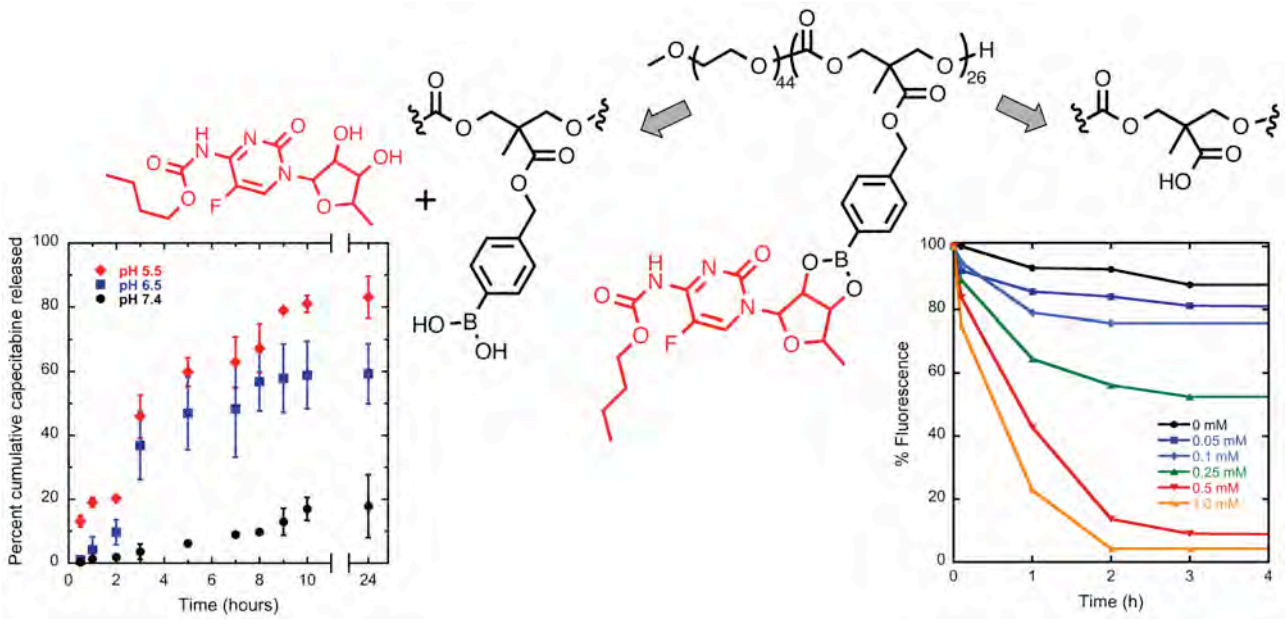
1. Luo, H.; Raciti, D.; Wang, C.; Herrera-Alonso, M. "Macromolecular brushes as stabilizers of hydrophobic solute nanoparticles" *Mol. Pharmaceutics* **2016**, *in press*.
2. Aguirre-Chagala, Y.E.; Santos, J.L.; Huang, Y.; Herrera-Alonso, M. "Phenylboronic acid-installed polycarbonates for the pH-dependent release of diol- containing molecules" *ACS Macro Letters* **2014**, *3*, 1249-1253.
3. Aguirre-Chagala, Y.E.; Santos, J.L.; Aguilar-Castillo, B.A.; Herrera-Alonso, M. "Synthesis of copolymers from phenylboronic acid-installed cyclic carbonates", *ACS Macro Letters* **2014**, *3*, 353-358.
4. Luo, H.; Santos, J.L.; Herrera-Alonso, M. "Toroidal structures from brush amphiphiles" *Chem. Commun.* **2014**, *50*, 536-538.
5. Aguirre-Chagala, Y. E.; Santos, J. L.; Herrera-Nájera, R.; Herrera-Alonso, M. "Organocatalytic copolymerization of a cyclic carbonate bearing protected 2,2-bis(hydroxymethyl) groups and D,L-lactide. Effect of hydrophobic block chemistry on nanoparticle properties" *Macromolecules* **2013**, *46*, 5871-5881.

Functional polycarbonates as environmentally responsive materials

Margarita Herrera-Alonso

Department of Materials Science and Engineering
3400 North Charles Street, Maryland Hall
Johns Hopkins University
Baltimore, MD 21218-2608, USA
Email: herrera@jhu.edu

The growing need for increasingly versatile biomaterials has spurred the development of functional versions of traditionally used polymers, on occasions with unique molecular architecture.[1,2,3] Among these are aliphatic polycarbonates, the physicochemical properties of which can be readily modified by installation of functional reactive handles, including 1,3-diols and boronic acids.[4] Organoboron polymers are particularly interesting because of their capacity to reversibly bind to diol- and catechol- containing molecules, and reactivity toward hydrogen peroxide. Diol- or boronic acid-containing polymers were studied in the context of polymer-based nanoparticle delivery systems for hydrophobic and hydrophilic solutes,[5,6] harnessing the property of boronic acids to enable pH-dependent delivery and to trigger nanoparticle destabilization under oxidative conditions.



References

1. Luo, H.; Raciti, D.; Wang, C.; Herrera-Alonso, M. *Mol. Pharmaceutics* **2016**, *in press*.
2. Luo, H.; Santos, J.L.; Herrera-Alonso, M. *Chem. Commun.* **2014**, *50*, 536-538.
3. Santos, J. L.; Herrera-Alonso, M. *Macromolecules* **2014**, *47*, 137-145.
4. Aguirre-Chagala, Y. E.; Santos, J. L.; Herrera-Nájera, R.; Herrera-Alonso, M. E. *Macromolecules* **2013**, *46*, 5871-5881.
5. Aguirre-Chagala, Y.E.; Santos, J.L.; Aguilar-Castillo, B.A.; Herrera-Alonso, M. *ACS Macro Letters* **2014**, *3*, 353-358.
6. Aguirre-Chagala, Y.E.; Santos, J.L.; Huang, Y.; Herrera-Alonso, M. *ACS Macro Letters* **2014**, *3*, 1249-1253.

Curriculum Vitae

Name: **MITSUO SAWAMOTO**

Date of birth: December 12, 1951

Title: Professor, Dr. Eng.

Affiliation: Kyoto University, Department of Polymer Chemistry
Graduate School of Engineering
Katsura, Nishikyo-ku, Kyoto 615-8510, Japan

Telephone, Fax, E-mail, Website: TEL: +81-75-383-2600; FAX: +81-75-383-2601
sawamoto@star.polym.kyoto-u.ac.jp http://living.polym.kyoto-u.ac.jp

Education:

BS	Kyoto University, 1974
MS	Kyoto University, 1976
Ph.D.	Kyoto University, 1979
Postdoc	The University of Akron, 1980–81

Current Appointments:

Kyoto University, Professor (1994-present)
Member, The Science Council of Japan (2005–present)

Recent Awards:

2016 Alexander von Humboldt Research Award
2015 Medal of Honor with Purple Ribbon (presented by Emperor Akihito and PM Sinzo Abe)
2014 NIMS Award on Strong Future of Soft Materials (National Inst. for Materials Sci.)
2013 SPSJ Award for Outstanding Achievement in Polymer Science and Technology
2012 MacroGroup UK Medal for Outstanding Achievement in Polymer Science (RSC)
2002 Arthur K. Doolittle Award (American Chemical Society, PMSE Division)
1999 Divisional Research Award of the Chemical Society of Japan
1992 Award of the Society of Polymer Science, Japan

Research Interests:

Living Polymerization, Precision Polymer Synthesis, Radical Polymerization, Cationic Polymerization, Sequence Control, Chemistry of Reaction Intermediates

Selected Representative Publications:

1. Ouchi, M.;
2. Hibi, Y.; Ouchi, M.; Sawamoto, M. "Strategy for Sequence Control in Vinyl Polymers via Iterative Controlled Radical Cyclization" *Nat. Commun.* **2016**, in press (DOI: 10.1038/ncommn11064).
3. Ogura, Y.; Terashima, T.; Sawamoto, M. "Terminal-Selective Transesterification of Chlorine-Capped Poly(methyl Methacrylate)s: A Modular Approach to Telechelic and Pinpoint-Functionalized Polymers" *J. Am. Chem. Soc.* **2016**, *138*, in press (DOI: 10.1021/jacs.6b01239).
4. Koda, Y.; Terashima, T.; Sawamoto, M. "Fluorous Microgel Star Polymers: Selective Recognition and Separation of Polyfluorinated Surfactants and Compounds in Water. *J. Am. Chem. Soc.* **2014**, *136*, 15742-15748.
5. Lutz, J. F.; Ouchi, M.; Liu, D. R.; Sawamoto, M. "Sequence-Controlled Polymers" *Science* **2013**, *341*, 1238149.
6. Ouchi, M.; Badi, N.; Lutz, J. F.; Sawamoto, M. "Single-Chain Technology using Discrete Synthetic Macromolecules" *Nat. Chem* **2011**, *3*, 917–924.

From Cationic to Radical Living Polymerizations: "Back to the Future of Polymer Chemistry"

Mitsuo Sawamoto

Department of Polymer Chemistry
Graduate School of Engineering, Kyoto University
Katsura, Nishikyo-ku, Kyoto 615-8510, Japan
Email: sawamoto@star.polym.kyoto-u.ac.jp

This lecture will present an account for two living polymerizations (Fig. 1), not simply to look back the past but to look forward to the future of polymer chemistry:[1] The first Lewis acid-catalyzed living cationic polymerization in 1984;[2,3] the first metal-catalyzed living radical polymerization in 1995.[4,5] Importantly, their discovery helped establishment of a concept "dormant-active species equilibrium" for precision polymerization (Fig. 2), triggering a vivid revitalization of the fields and extensive efforts for precision polymer synthesis (Fig. 3). A current focus of interest for the future is directed to the precision sequence control on macromolecules of carbon backbones (Fig. 4).

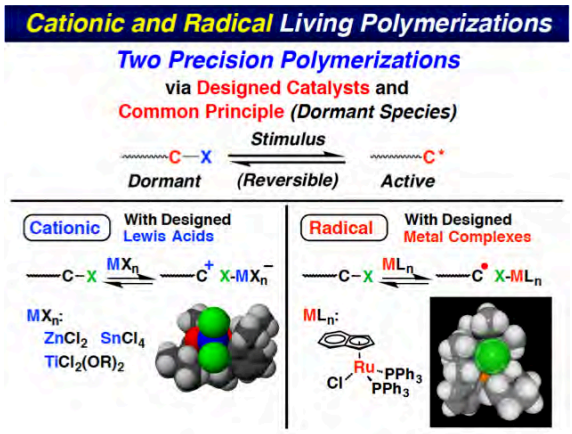


Fig. 1. Two living polymerizations.

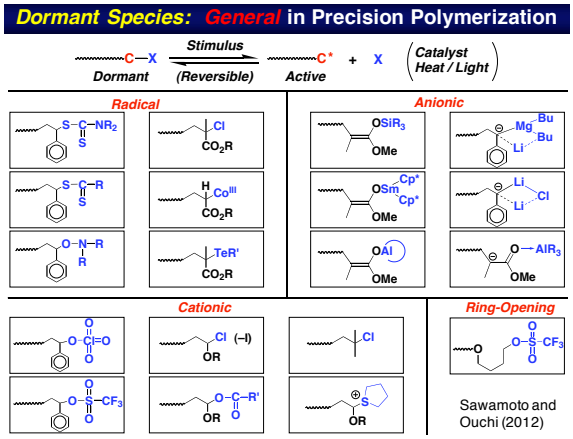


Fig. 2. Generality of "dormant" species.

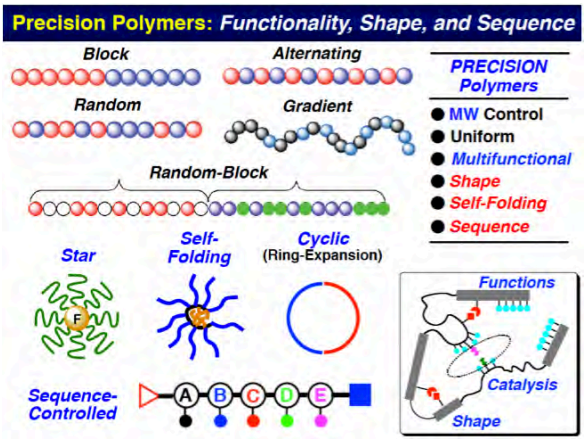


Fig. 3. Precision functional polymers.

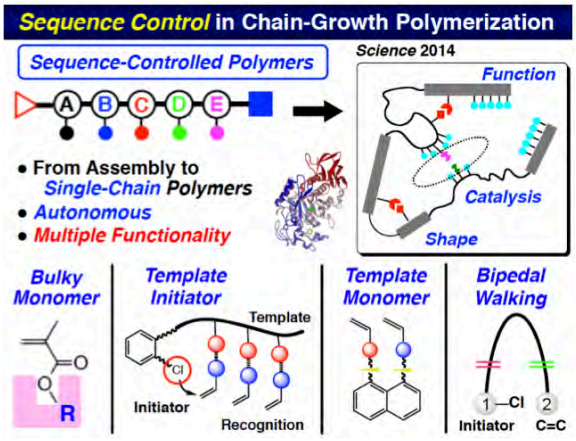


Fig. 4. Sequence-controlled polymers.

References

1. Ouchi, M.; Terashima. T.; Sawamoto, M. *Acc. Chem. Res.* **2008**, *41*, 1120–1132.
2. Miyamoto, M.; Sawamoto, M.; Higashimura, T. *Macromolecules* **1984**, *17*, 265–268.
3. Sawamoto, M. *Prog. Polym. Sci.* **1991**, *16*, 111–172.
4. Kato, M.; Kamigaito, M.; Sawamoto, M.; Higashimura, T. *Macromolecules* **1995**, *28*, 1721–1723.
5. Kamigaito, M.; Ando, T; Sawamoto, T. *Chem. Rev.* **2001**, *101*, 3689–3745.

CURRICULA VITAE

FOR

ORGANIZERS

Curriculum Vitae

Name: **HEATHER MAYNARD**

Date of Birth: May 3, 1970

Title: Professor

Affiliation: UCLA, Division of Physical Sciences
Department of Chemistry and Biochemistry
Los Angeles, CA 90095, USA

Telephone, Fax, E-mail, Website: TEL +1-310-267-5162, FAX +1-310-206-4038
maynard@chem.ucla.edu; www.chem.ucla.edu/dept/Faculty/maynard/

Education:

B.S.	University of North Carolina at Chapel Hill, 1992
Ph.D.	California Institute of Technology, 2000
Postdoc	Swiss Federal Institute of Technology (Jeffrey Hubbell), 2000-2002

Current Appointments:

UCLA, Professor (2012 - present)
Director, Chemistry-Biology Interface Training Program, NIH (2011 - present)
Associate Director, California NanoSystems Institute (2015 - present)

Recent Awards:

2016	Defense Science Study Group Member
2013	Herbert Newby McCoy Award for Outstanding Research
2013	POLY Fellow of the ACS
2012	Leverhulme Fellow
2011	Fellow of the Royal Society of Chemistry
2011	Kavli Frontiers Fellow

Research Interests:

Biomimetic Polymer Synthesis and Application, Hydrogel Synthesis, Novel Polymeric Resists, Polymers that Stabilize and Delivery Proteins

Selected Representative Publications:

1. Decker. C. G.; Wang, Y.; Paluck, S. J.; Shen, L.; Loo, J. A.; Levine, A. J. Miller L. S.; Maynard, H. D. "Fibroblast Growth Factor 2 Dimer with Superagonist *In Vitro* Activity Improves Granulation Tissue Formation During Wound Healing" *Biomaterials*, **2016**, *81*, 157-168.
2. Lau, U. Y.; Saxer, S. S.; Lee, J.; Bat, E.; Maynard, H. D. "Direct Write Protein Patterns for Multiplexed Cytokine Detection from Live Cells Using Electron Beam Lithography" *ACS Nano*, **2016**, *10*, 723-729.
3. Bat, E.; Lee, J.; Lau, U. Y.; Maynard, H. D. "Trehalose Glycopolymer Resists Allow Direct Write of Protein Patterns by E-Beam Lithography" *Nature Communications*, **2015**, *6*, 6654-6661.
4. Nguyen, T. H.; Kim, S.-H.; Decker, C. G.; Wong, D. Y.; Loo, J. A.; Maynard, H. D. "A Heparin-Mimicking Polymer Conjugate Stabilizes basic Fibroblast Growth Factor" *Nature Chemistry*, **2013**, *5*, 221-227.
5. Matsumoto, N. M.; Prabhakaran, P.; Rome, L. H.; Maynard, H. D. "Smart Vaults: Thermally-Responsive Protein Nanocapsules" *ACS Nano*, **2013**, *7*, 867-874.

Curriculum Vitae

Name: **EIJI YASHIMA**

Date of Birth: December 25, 1958

Title: Professor

Affiliation: Nagoya University, Graduate School of Engineering,
Department of Molecular Design and Engineering
Chikusa-ku, Nagoya 464-8603, Japan

Telephone, Fax, E-mail, Website: TEL +81-52-789-4495, FAX +81-52-789-3185
yashima@apchem.nagoya-u.ac.jp; http://helix.mol.nagoya-u.ac.jp/e/index.html

Education:

BS	Osaka University, 1982
Ph.D	Osaka University, 1988
Postdoc	University of Massachusetts at Amherst (David A. Tirrell), 1988 - 1989

Current Appointments:

Nagoya University, Professor (1998 - present)
The Science Council of Japan, Associate Member (2006 - present)
Senior Program Officer of Research Center for Science Systems, JSPS (2015 - present)

Recent Awards:

2015	The Chemical Society of Japan Award
2013	Chirality Medal
2010	Fellow of the Royal Society of Chemistry
2008	Award of The Society of Polymer Science, Japan
2007	Thomson Reuters Scientific Research Front Award
2005	Molecular Chirality Award 2005

Research Interests:

Synthesis of Helical Molecules, Supramolecules, and Polymers with Novel Structures and Functions (Chiral Recognition, Sensing and Asymmetric Catalysis)

Selected Representative Publications:

1. Suzuki Y.; Nakamura, H.; Iida, H.; Ousaka, N.; Yashima, E. "Allosteric Regulation of Unidirectional Spring-like Motion of Double-Stranded Helicates" *J. Am. Chem. Soc.* **2016**, *138*, 4852-4859.
2. Mamiya, F.; Ousaka, N.; Yashima, E. "Remote Control of the Planar Chirality in Peptide-Bound Metallomacrocycles and Dynamic-to-Static Planar Chirality Control Triggered by Solvent-Induced 3_{10}-to-α-Helix Transitions" *Angew. Chem., Int. Ed.,* **2015**, *54*, 14442-14446.
3. Makiguchi, W.; Tanabe, J.; Yamada, H.; Iida, H.; Taura, D.; Ousaka, N.; Yashima, E. "Chirality- and Sequence-Selective Successive Self-Sorting via Specific Homo- and Complementary-Duplex Formations", *Nature Commun.* **2015**, *6*, doi:10.1038/ncomms8236.
4. Shimomura, K.; Ikai, T.; Kanoh, S.; Yashima, E.; Maeda, K. "Switchable Enantioseparation Based on Macromolecular Memory of a Helical Polyacetylene in the Solid State" *Nature Chem.* **2014**, *6*, 429-434.
5. Qi, S.; Iida, H.; Liu, L.; Irle, S.; Hu, W.; Yashima, E. "Electrical Switching Behavior of a [60]Fullerene-Based Molecular Wire Encapsulated in Syndiotactic Poly(methyl methacrylate) Helical Cavity" *Angew. Chem., Int. Ed.,* **2013**, *52*, 1049-1053.

CURRICULA VITAE

FOR

OBSERVERS

Curriculum Vitae

Name: **KEN CASTER**

Title: Technical Advisor, Program Officer

Affiliation: Asian Office of Aerospace Research and Development (AOARD/AFOSR), Tokyo, Japan,

Telephone, Fax, E-mail, Website: TEL +81-42-511-2003, FAX +81-42-511-2020; kenneth.caster@us.af.mil; kcchem83@gmail.com; https://community.apan.org/wg/afosr/w/researchareas/11117.materials-sciences/

Education:

BS	Stetson University, 1979
Ph.D.	Duke University, 1983 (Louis D. Quin)
NRSA (NIH-NEI) Postdoc	University of Florida (Alan R. Katritzky), 1983 – 1985

Professional Appointments:

Asian Office of Aerospace Research and Development (AOARD), 2012 - present
Program Officer: Materials, Chemistry, USAF-Taiwan Nanoscience programs

Air Force Office of Scientific Research (AFOSR), Arlington, VA, 2009-2012
Program Officer, Aerospace, Chemical and Material Sciences Directorate:
Synthetic Chemistry Molecular Design and Synthesis Portfolio

US Army Research Office (ARO), Durham, NC, 2005–2009
Scientific and Technical Support Contractor, Chemical Sciences Division: Polymer Science, Institute for Soldier Nanotechnologies (ISN), Institute for Collaborative Biotechnologies (ICB) programs

North Carolina State University (NCSU), Raleigh, NC, 2007-2009
Adjunct Assoc Professor, Department of Chemical and Biomolecular Engineering

Duke University, Durham, NC, 2003-2009
Sr. Research Scientist (non-tenure track faculty), Center for Biologically Inspired Materials and Material Systems (CBIMMS), Pratt School of Engineering

Lord Corporation, Cary, NC, 1994-2003
Staff Scientist, Millennium Research, Materials Division
Sr. Research Scientist, Product Development, Chemical Products Division

Union Carbide Corporation, South Charleston, WV, 1985-1994
Project Scientist, Solvents & Coatings Materials and Industrial Chemicals Divisions
Senior Chemist, New Product R&D, Solvents & Coatings Materials Division

Research Interests:

Organic and Materials Chemistry (organophosphorus and heterocyclic, polymer – ROMP, ADMET, brushes); Catalysis; Nano-synthesis/fabrication; Adhesion; Coatings; Process development

Curriculum Vitae

Name: **HIDETO ITO**

Date of Birth: October 6, 1983

Title: Lecturer

Affiliation: Nagoya University, Graduate School of Science,
Chikusa, Nagoya 464-8602, Japan

Telephone: +81-52-789-3551
E-mail: ito.hideto@g.mbox.nagoya-u.ac.jp
Website: http://synth.chem.nagoya-u.ac.jp/wordpress/staff/itohideto?lang=en

Education:

B.A.	Hokkaido University, 2007
Ph.D.	Hokkaido University, 2012
Postdoc	Nagoya University (Prof. Kenichiro Itami), 2012-2013

Current Appointments:

Nagoya University, Lecturer (2013 - present)

Recent Awards:

2015	SHOWA DENKO Award in Synthetic Organic Chemistry
2015	Nagoya University Liberal Arts and Sciences Education Award
2012	JSPS Ikushi Prize
2010	Otsu Conference Award Fellow
2009	Best Discussion Award in 21th Banyu Sapporo Symposium

Research Interests:

Synthetic chemistry; Organometallic chemistry; Molecular nanocarbon;

Selected Representative Publications:

1. Maeda, K.; Hong, L.; Nishihara, T.; Nakanishi, Y.; Miyauchi, Y.; Kitaura, R.; Ousaka, N.; Yashima, E.; Ito, H.; Itami, K. *"*Construction of covalent organic nanotubes by light-induced cross-linking of helical polymers*" submitted.*
2. Segawa, Y.; Ito, H.; Itami, K. "Structurally uniform and atomically precise carbon nanostructures" *Nature Rev. Mater.* **2016**, *1*, 15002.
3. Ozaki, K.; Kawasumi, K.; Shibata, M.; Ito, H.; Itami, K. "One-shot K-region-selective annulative π-extension for nanographene synthesis and functionalization" *Nature Commun.* **2015**, *6*, 6251.
4. Ito H.; Mitamura Y.; Segawa Y.; Itami K. "Thiophene-based, radial π -conjugation: synthesis, structure, and photophysical properties of cyclo-1,4-phenylene-2',5'-thienylenes" *Angew. Chem. Int. Ed.* **2015**, *54*, 159.
5. Ozaki, K.; Zhang H.; Ito H.; Lei A.; Itami K. "One-shot indole-to-carbazole π-extension by Pd-Cu-Ag trimetallic system" *Chem. Sci.* **2013**, *4*, 3416.

Curriculum Vitae

Name: **YOSHIO OKAMOTO**

Date of Birth: January 10, 1941

Title: Professor Emeritus (Nagoya University)

Chair Professor (Harbin Engineering University)

Affiliation: Nagoya University, Graduate School of Engineering,
Chikusa-ku, Nagoya 464-8603, Japan
Harbin Engineering University, Polymer Materials Research Center
145 Nantong St. Harbin 150001, China

Telephone, Fax, E-mail, Website: TEL +81-52-753-7292, FAX +81-52-753-7292
okamoto@apchem.nagoya-u.ac.jp; http://chiral.apchem.nagoya-u.ac.jp

Education:

B.A.	Osaka University, 1964
Ph.D.	Osaka University, 1969
Postdoc	University of Michigan (Charles G. Overberger), 1970 - 1972

Current Appointments:

Nagoya University, Distinguished Invited University Professor (2009 - present)

Recent Awards:

2014	Japan Academy Prize
2010	Ryoji Noyori Prize
2009	SPSJ Award for Outstanding Achievement of Polymer Science and Technology
2007	Thomson Reuters Scientific Research Front Award
2005	Fujiwara Prize
2002	Medal with Purple Ribbon

Research Interests:

Control of polymerization reactions, Asymmetric polymerization, Optically active polymers, Enantioseparation by chromatography

Selected Representative Publications:

1. Shen, J.; Okamoto, Y. "Efficient Separation of Enantiomers Using Stereoregular Polymers", *Chem. Rev*., **2016**, *116*, 1096-1138.
2. Okamoto, Y., "Precision Synthesis, Structure and Function of Helical Polymers", *Proc. Jpn. Acad., Ser.* **2015**, *B91*, 246-259.
3. Zhang, C.; Wang, H.; Yang T.; Ma, R.; Liu, L.; Sakai, R.; Satoh, T.; Kakuchi, T.; Okamoto, Y., "Synthesis and Chiral Recognition of Helical Poly(phenylacetylene)s Bearing L-Phenylglycinol and its Phenylcarbamates as Pendants", *J. Polym. Sci. Part A: Polym. Chem.,* **2015**, *53*, 809-821.
4. Zhang L.; Shen, J.; Zuo, W.; Okamoto, Y., "Synthesis of Chitosan 2,6-diphenylcarbamate-2-urea derivatives and their applications as chiral stationary phases for high-performance liquid chromatography", *J. Chromatogr. A*, **2014**, *1365*, 86-93.
5. Shen, J.; Ikai, T.; Okamoto, Y., "Synthesis and Application of Immobilized Polysaccharide-based Chiral Stationary Phases for Enantioseparation by High-performance Liquid Chromatography", *J. Chromatogr. A*, **2014**, *1363*, 51-61.

CURRICULA VITAE

FOR

INDUSTRIAL OBSERVERS

(U.S.A. AND JAPAN)

Bruce Hahn

6881 Darrow Rd, Hudson, Ohio 44236: bruce.hahn@goodyear.com

Education

BA Chemistry and English, Ohio University 1976-1980]

PhD Macromolecular Science, Case Western Reserve University 1984 to 1988

Experience

Senior R&D Associate, Goodyear Tire and Rubber 1988 to present

Has worked in the area or Rubber Science and Rubber Compound Science throughout Goodyear Career

Publications

Over 40 Patents and several publications and presentations.

Awards

Goodyear Innovator of the Year 2015

Goodyear Inventor of the Year 2013

YONG ZHANG

6000 N Teutonia Ave, Milwaukee, Wisconsin 53209, USA

Phone: +1 414 438 5052 **yong.zhang@sial.com**

Summary

- Advanced degrees both in Chemical Engineering (Ph.D.) and Business Administration (MBA)
- 10+ years of technology experience on Materials Science/Polymer/Semiconductor/Medical Device/Clean Tech
- Outstanding strategic marketing, product & business development, IP evaluation, and financial analysis capability; experience on Licensing, Due diligence, Term sheets drafting & contract negotiation, Merger & Acquisition

Experience

MilliporeSigma (a business of **Merck KGaA**, Darmstadt, Germany) **Milwaukee, WI**

Senior Global Product Manager *2016 to present*

- Lead team to manage polymer & organic materials product line within life science business of Merck KGaA, focus on disruptive technology roadmapping (3D Printing, Nanomedicine etc.) and new product development for global research customer segment
- Product management liaison to applied/commercial customer segment: launch of water filtration product offer in 2016 with strategic marketing & global sales team, targeted to GE Osmosis, Dow FilmTec, Toray, Danaher Pall etc.

SIGMA-ALDRICH CORP **Milwaukee, WI**

Global Market Segment Manager *2013 to 2015*

- Responsible for P&L of global product/market segment in polymer and organic materials for Energy, Electronics & Biomedical applications
- Lead product managers and tactical marketing specialist to define and execute Go-To-Market strategy: value proposition, branding, new product roadmaps, NPI stage gate review, pricing, budgeting, communication and e-marketing
- Designed specialty chemical marketing campaign and launched product offers for medical device (contact lens & dental) markets
- Perform market and technology research, support and train global sales team across all business units
- Collaborate with academia leaders and launched *Aldrich Lecture* at Columbia U, Georgia Tech, EPFL (Switzerland) and *Polymer Workshop* at Stanford U
- Co-authored a book (chapter): *Organic and Hybrid Solar Cells (Alternative Electrodes)*, Springer International Publishing AG, 2014
- Editor for: *Material Matters* ™ *vol.9, issue 3, 2014, Polymers in Therapeutics & Nanomedicine*

Global Product Manager *2012 to 2013*

- Manage global product line in Organic & Printed Electronics and Nano Materials
- Developed strategy, business plan and roadmap, driving innovation oriented product development through global industrial partnership and academia collaborations
- Grew materials science core business revenues through strategic marketing campaigns and tactical marketing vehicles: product license/distribution, contract negotiation, IP evaluation, sponsorship, market research, Segmenting/Targeting/Positioning, webcast, Ads, trade show, customer visits, press release
- Designed and launched interactive marketing eTool: OLED eFabricator, unique web-view traffic over 20,000 times in 1.5 years
- Editor for Aldrich flagship technical periodical journal: *Material Matters* ™
  vol.7, issue 1, 2012, Innovative Materials for High-Performance Optoeletronic Devices
  vol.8, issue 1, 2013, Materials for Bioelectronic and Biomedical Applications

CABOT MICROELECTRONICS CORP **AURORA, IL**

Senior Research Engineer *2011*

- Led discovery of next generation chemical mechanical polishing (CMP) products and platform technologies in both business and emerging technology segments
- Six-Sigma *Green Belt* Certified in 4 months, improved a key production process yield to almost 100%; completed Six-Sigma *Black Belt* Training
- Hands-on experience on Thermoplastic Urethane (TPU) and Thermoset Polyurethane

AMBASSADOR INVESTMENTS **INDIANAPOLIS, IN**

Intern (part time) *2010*

- Performed as an investment assistant in technology group of Ambassador Investments (Indiana based private equity firm), developed and implemented strategic M&A plan on early/growth stage web-based small business

PRAXAIR, INC **INDIANAPOLIS, IN**
Development Engineer *2007-2010*

- Successfully finished a key project for developing next generation of CMP products for semiconductor industry: product serving global customers *Intel, Samsung, TSMC, Hynix, UMC, SMIC* and *Sony*
- *Premier Choice Award* by Chief Technology Officer (CTO) of Praxair, Inc., *2010*
- Primary inventor for US and world patents, *US 8,551,201 B2 "Polyurethane composition for CMP pads and method of manufacturing same"*
- *Teamwork Award* by Praxair Electronics for excellent support in new product development, *2008*
- Excellent technical customer support for joint projects with *Applied Materials, Cytec Industries* and *Sekisui Chemical Co.(Japan)*

BAUSCH & LOMB, INC **ROCHESTER, NY**
R&D Intern *2007*

- Developed novel biomedical materials and formulations for next generation contact lenses application

UNIVERSITY OF ROCHESTER **ROCHESTER, NY**

- Developed novel photovoltaic nano and organic semiconducting materials including Ag or Au nanorods and nanorings, CdSe nanowires, TiO_2 nanotubes, , fullerenes (C60) and thiophene based polymers
- Co-invented surface-initiated polymerization of semiconducting organic polymers for solar cells and organic field effect transistors and filed one US patent
- Co-author 9 peer-reviewed publications in polymer materials field

PEKING UNIVERSITY **BEIJING, CHINA**

- Synthesized photochromic polymers for holographic information storage application;
- Co-author 5 peer-reviewed publications in polymeric materials

Education

INDIANA UNIVERSITY **INDIANAPOLIS, IN**
MBA, Marketing & Technology Management *2010*

UNIVERSITY OF ROCHESTER **ROCHESTER, NY**
Ph.D., Chemical Engineering *Supervisors: Prof. Lewis Rothberg* *2007*

PEKING UNIVERSITY **BEIJING, CHINA**
M.S., Polymer Science and Engineering *Supervisors: Prof. Zhou Qi-feng* *2002*

NANKAI UNIVERSITY **TIANJIN, CHINA**
B.S., Chemistry *1999*

Professional Affiliations

American Institute of Chemical Engineers (AIChE) *since 2013*

Biomedical Engineering Society (BMES) *since 2013*

American Chemical Society (ACS) *since 2005*

Indiana Session Working Committee for National Chemistry Week 2009

Material Research Society (MRS) *since 2005, U of Rochester Chapter Conference Organizer*

Indiana Venture Club *2009*

Singapore Institute of Materials Research and Engineering *Invited Speaker, 2006*

Appl. Phys. A; J. Mater. Chem.; Mater. Chem. & Phys.; J. Polymer Res.; Polymer Engineering & Science
Journal Article Reviewer since 2006

Curriculum Vitae

Name: **KOJI ENDO**

Date of Birth: June 30, 1974

Title: Manager

Affiliation: Polymerization Catalysts Department
Process Technology Laboratory, R&D Center
Mitsui Chemicals, Inc.
580-32 Nagaura, Sodegaura, Chiba 299-0265, Japan

Telephone, Fax, E-mail, Website: TEL +81-438-64-2317, FAX +81-438-64-2375
Kouji.Endo@mitsuichemicals.com
http://www.mitsuichem.com/index.htm

Education: BS Tohoku University, 1997
MS Tohoku University, 1999

Career:

Mitsui Chemicals, Inc.; Researcher (1999-2015)
California Institute of Technology; Visitor (2008-2010)
Mitsui Chemicals, Inc.; Manager (2015 - present)

Research Interests:
Organometallic Chemistry, Olefin Polymerization Catalysts, Olefin Metathesis Catalysts

Selected Representative Publications:

1. Endo, K.; Grubbs, R. H. "Chelated Ruthenium Catalysts for *Z*-Selective Olefin Metathesis" *J. Am. Chem. Soc.* **2011**, *133*, 8525-8527.
2. Keitz, B. K.; Endo, K.; Herbert, M. B.; Grubbs, R. H. "Chelated Ruthenium Catalysts for *Z*-Selective Olefin Metathesis" *J. Am. Chem. Soc.* **2011**, *133*, 9686-9688.
3. Keitz, B. K.; Endo, K.; Patel, P. R.; Herbert, M. B.; Grubbs, R. H. "Improved Ruthenium Catalysts for *Z*-Selective Olefin Metathesis" *J. Am. Chem. Soc.* **2012**, *134*, 693-699.
4. Endo, K.; Herbert, M. B.; Grubbs, R. H. "Investigations into Ruthenium Metathesis Catalysts with Six-Membered Chelating NHC Ligands: Relationship between Catalyst Structure and Stereoselectivity" *Organometallics*, **2013**, *32*, 5128-5135.
5. Endo, K.; Grubbs, R. H. "Cationic Ruthenium Alkylidene Catalysts Bearing Phosphine Ligands" *Dalton Trans.* **2016**, *45*, 3627-3634.

Curriculum Vitae

Name: **Yuki Gohara**

Date of Birth: April 26, 1980

Title: Tokyo Area Sales Manager

Affiliation: Asahi Techneion CO., LTD.,
Scientific Instrument Department
Shinjuku-ku, Tokyo 160-0022, Japan

Telephone, Fax, E-mail, Website: TEL +81-3-3225-6228, FAX +81-3-5360-6360
y.gouhara@asahi-techenion.co.jp; http://www.asahi-techneion.co.jp

Education: A.A. Palomar College, 2007

Curriculum Vitae

Name: **Shigetaka HAYANO**

Date of Birth: October 15, 1972

Title: Senior Chief Researcher

Affiliation: Zeon Corporation, R&D Center, New Materials Development Lab.
yako1-2-1, kawasaki-ward, kawasaki-city, Japan

Telephone, Fax, E-mail, Website: TEL +81-44-276-3740, FAX +81-44-276-3957
S.Hayano@zeon.co.jp; http://www.zeon.co.jp/

Education:

BA	Kyoto University, 1995
MS	Kyoto University, 1997
Ph.D.	Kyoto University, 2000

Current Appointments:
Zeon Corporation, Senior Chief Researcher (2000 - present)

Research Interests:
Syntheses, Properties and Applications of Well-defined Polymer Materials

Curriculum Vitae

Name: **HAJIME INAMI**

Date of Birth: March 29, 1982

Job: Research Chemist

Affiliation: JSR Corporation, Polymer Materials Laboratories
Performance Polymer Research Laboratories
100, Kawajiri-cho, Yokkaichi, Mie 510-8552, Japan

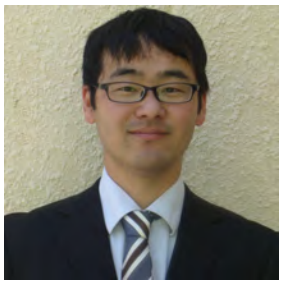
Telephone, Fax, E-mail, Website: TEL +81-59-345-8621, FAX +81-59-345-8626
Hajime_Inami @jsr.co.jp; http://www.jsr.co.jp/

Education: BS Tokyo University of Science, 2004
MS Tokyo University of Science, 2006

Professional Appointments:
The Society of semiconductor materials (2015 - present)

Research Interests:
Synthesis of low molecular materials, Photosensitive materials

Curriculum Vitae



Name: **KUMPEI KOBAYASHI**

Date of Birth: May 16, 1979

Job: Research Chemist

Affiliation: JSR Corporation, Polymer Materials Laboratories
Performance Polymer Research Laboratories
100, Kawajiri-cho, Yokkaichi, Mie 510-8552, Japan

Telephone, Fax, E-mail, Website: TEL +81-59-345-8066, FAX +81-59-345-8102
Kunpei_Kobayashi@jsr.co.jp; http://www.jsr.co.jp/

Education: BS Osaka Prefecture University, 2002
MS Osaka Prefecture University, 2004
Visiting Scholar University of California Los Angeles (Bruce Dunn), 2013- 2015

Professional Appointments:
The society of rubber science and technology (2015 - present)

Research Interests:
Organic-inorganic hybrid materials, Living anionic polymerization, Sol-gel chemistry

Curriculum Vitae

Name: **TOMOAKI MATSUGI**

Date of Birth: December 1, 1972

Title: Manager, Dr. Eng.

Affiliation: Polymer Technology Department
Polymeric Materials Laboratory, R&D Center
Mitsui Chemicals, Inc.
580-32 Nagaura, Sodegaura, Chiba 299-0265, Japan

Telephone, Fax, E-mail, Website: TEL +81-438-64-2330, FAX +81-438-64-2442
Tomoaki.Matsugi@mitsuichemicals.com;
http://www.mitsuichem.com/index.htm

Education:

BS	Kyusyu University, 1995
MS	Kyushu University, 1997
Ph.D.	Kyushu University, 2008

Professional Appointments:

Mitsui Petrochemical Industries (now Mitsui Chemicals, Inc.) (1997)
Mitsui Chemicals, Inc.; Manager (2012 - present)

Awards:

2009 SPSJ Award for the Outstanding Paper in Polymer Journal

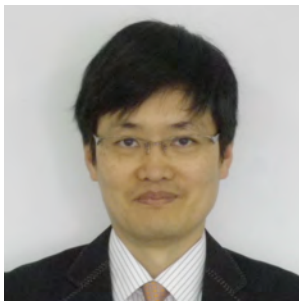
Research Interests:

Synthesis of polyolefin-based functional polymers, Olefin polymerization catalysts

Selected Representative Publications:

1. Sugimoto, R.; Matsugi, T. "Direct Incorporation of Hydroxy Groups into Isotactic Polypropylene via Metallocene-Catalyzed Copolymerization of Ester Group Containing Vinyl Monomer Treated with Dialkylaluminum Hydride and Propylene" *Bull. Chem. Soc. Jpn.*, **2015**, 88 (9), 1238–1240.
2. Matsugi, T.; Saito J.; Kawahara, N.; Matsuo, S.; Kaneko, H.; Kashiwa, N. ; Kobayashi, M.; Takahara, A. "Surface Modification of Polypropylene Molded Sheets by Means of Surface-Initiated ATRP of Methacrylates" *Polymer J.*, **2009**, 41, 547–554.
3. Matsugi, T.; Fujita, T. "High-performance Olefin Polymerization Catalysts Discovered on the Basis of a New Catalyst Design Concept" *Chem. Soc. Rev.*, **2008**, 37, 1264–1277.
4. Matsugi, T.; Kojoh, S.; Kawahara, N.; Matsuo, S.; Kaneko, H.; Kashiwa, N. "Synthesis and Morphology of Polyethylene-*block*-Poly(methyl methacrylate) Through the Combination of Metallocene Catalysis with Living Radical Polymerization" *J. Polym. Sci., Part A: Polym. Chem.*, **2003**, 41, 3965–3973.
5. Kashiwa, N.; Matsugi, T.; Kojoh, S.; Kaneko, H.; Kawahara, N.; Matsuo, S.; Nobori, T.; Imuta, J. "Functionalization of Polyethylene Based on Metallocene Catalysis and Its Application to Syntheses of New Graft Copolymers Possessing Polar Polymer Segments" *J. Polym. Soc. Part A: Polym. Chem.*, **2003**, 41, 3657–3666.
6. Matsugi, T.; Matsui, S.; Kojoh, S.; Takagi, Y.; Inoue, Y.; Nakano, T.; Fujita, T.; Kashiwa, N. "New Titanium Complexes Bearing Two Indolide−Imine Chelate Ligands for the Polymerization of Ethylene" *Macromolecules*, **2002**, 35 (13), 4880–4887.

Curriculum Vitae



Name: **YOSHIKI NAKAGAWA**

Date of Birth: April 13, 1964

Title: **Ph.D.**

Affiliation: General Manager
Frontier Materials Development Laboratories
KANEKA CORPORATION
5-1-1, Torikai-nishi, Settsu Osaka, 566-0072, Japan

Telephone, Fax, E-mail, Website: TEL +81-72-653-8298 DIRECT +81-50-3133-8758
FAX 072-653-8296
Yoshiki.Nakagawa@kaneka.co.jp

Education: BS Kyoto University, 1987
MS Kyoto University, 1989
Ph.D. Kyoto University, 1992
Visiting Scholar Carnegie Mellon University (Krzysztof Matyjaszewski), 1995 – 1997

Professional Appointments:
KANEKA CORPORATION (1992 - present)

Recent Awards:
2011 Award of The Society of Polymer Science, Japan
2009 Presidential Green Chemistry Challenge (with Prof. Matyjaszewski)
2009 The Kinki Chemical Society Award for Chemical Technology

Research Interests:
Living Radical Polymerization, Living Cationic Polymerization, Telechelic Polymer

Selected Representative Publications:
1. Y. Nakagawa, S. Yukimoto, *Journal of ASTM International*, **6**, Paper ID JAI102038.

Curriculum Vitae

Name: **KAZUO TAKAOKI**

Date of birth: October 26, 1970

Title: Senior Research Associate

Affiliation: SUMITOMO CHEMICAL CO., LTD., PETROCHEMICALS RESEARCH LABORATORY, 2-1 KITASODE, SODEGAURA, CHIBA 299-0295, JAPAN

Telephone, Fax, E-mail, Website: TEL. +81-436-61-5243, FAX +81-436-61-5359, takaoki@sc.sumitomo-chem.co.jp

Education: BS The University of Tokyo, 1994
MS The University of Tokyo, 1996
Visiting Scholar University of California, Berkeley (T. Don Tilley), 2003-2005

Professional Appointments:
Senior Research Associate, Sumitomo Chemical Co., Ltd. 2010-present

Research interests:
Olefin Polymerization Catalysts and Cocatalysts; polymer material synthesis and application

Selected representative publications:
1. Takaoki, K.; Nakahara, S.; Okado, Y.; Seki, Y.; Miyatake, T. "New bismuth cocatalyst for metallocene-mediated olefin polymerization" *Studies in Surface Science and Catalysis* **2007**, *172* (Science and Technology in Catalysis 2006), 523 – 524.
2. Takaoki, K.; Miyatake, T.; "Titanium and vanadium based non-metallocene catalysts for olefin polymerization" *Macromolecular Symposia* **2000**, *157* (International Symposium on Ionic Polymerization, 1999), 251 – 257.
3. Takaoki, K.; Nomura, K.; Naga, N.; Imai, A. "Synthesis of titanium complexes containing bis(silylamide) ligand for olefin polymerization" *Studies in Surface Science and Catalysis* **1999**, *121* (Science and Technology in Catalysis 1998), 469 – 472.
4. Nomura, K.; Naga, N.; Takaoki, K. "Ethylene Homopolymerization and Ethylene/1-Butene Copolymerization Catalyzed by a [1,8-C10H6(NR)2]TiCl2-Cocatalyst System" *Macromolecules* **1998**, *31*, 8009 – 8015.
5. Nomura, K.; Naga, N.; Takaoki, K.; Imai, A. "Synthesis of titanium(IV) complexes that contain the Bis(silylamide) ligand of the type [1,8-C10H6(NR)2]2-, and alkene polymerization catalyzed by [1,8-C10H6(NR)2]TiCl2-cocatalyst system" *Journal of Molecular Catalysis A: Chemical* **1998**, *130*, L209 – L213.

Curriculum Vitae

Name: **KIYOHARU TSUTSUMI**

Date of Birth: May 2, 1965

Title: Principal Manager

Affiliation: Daicel Corporation
Advanced Materials Planning, R&D Headquarters
JR Shinagawa East Bldg., 2-18-1, Konan, Minato-ku,
Tokyo 108-8230, Japan

Telephone, Fax, E-mail, Website:
Tel +81-3-6711-8162 Fax +81-3-6711-8168
ky_tsutsumi@jp.daicel.com http://www.daicel.com/

Education: Bachelor of Engineering, Nagoya University, 1989
Doctor of Engineering, Nagoya University, 1994

Professional Appointments:
Researcher, "Hashimoto Polymer Phasing Project", ERATO, JST
(Apr.1994 – Sep.1998)
Researcher, Daicel Corporation (Oct.1998 – Jun.2003)
Senior Researcher, Daicel Corporation (Jul.2003 – Jun.2010)
Research Director, Daicel Corporation (Jul.2010 – Mar.2016)
Principal Manager, Daicel Corporation (Apr.2016 – present)
Member of Steering Committee, Kansai Regional Chapter, SPSJ
(Jun.2014 – May.2016)

Research Interests:
Radical Polymerization, Living Polymerization, Phase Separation of Block Copolymer, Photoresist Polymer, and Nanocomposite Material

Curriculum Vitae

Name: **Tommy Uchida**

Date of Birth: August 8, 1967

Title: Director

Affiliation: Asahi Techneion CO., LTD.,
Business Development
Shinjuku-ku, Tokyo 160-0022, Japan

Telephone, Fax, E-mail, Website: TEL +81-3-5363-8941, FAX +81-3-5361-8165
t.uchida@asahi-techenion.co.jp; http://www.asahi-techneion.co.jp

Education: B.A. KINDAI University, 1989

Faculty of Humanity-Oriented Science and Engineering

Curriculum Vitae

Name: **HIDEKAZU YAMADA**

Date of Birth: March 8, 1985

Title: Researcher, Dr. Eng.

Affiliation: Sumitomo Chemical, Petrochemical Laboratory,
Sodegaura, Chiba 299-0295, Japan

Telephone, Fax, E-mail: TEL +81-436-61-1120(4251), FAX +81-436-61-5129
yamadah9@sc.sumitomo-chem.co.jp

Education:

BS	Nagoya University, 2007
MS	Nagoya University, 2009
Ph.D.	Nagoya University, 2012

Professional Appointments:

Sumitomo Chemical, Researcher (2012 - present)

Research Interests:

Polypropylene-based Materials, Supramolecules

Selected Representative Publication:

Nojiri, S.; Yamada, H.; Kimata, S.; Ikeda, K.; Senda, T.; Bosman, A. W. ” Supramolecular polypropylene with self-complementary hydrogen bonding system“ *Polymer* **2016**, *87*, *308*.

Curriculum Vitae

Name: **Koji Yamauchi**

Title: Research Fellow, Manager

Affiliation: Chemicals Research Laboratories,

Plastic Research Laboratory, TORAY Industries, Inc.

9-1, Oe-cho, Minato-ku, Nagoya, 455-8502, Japan

E-mail: koji_yamauchi@nts.toray.co.jp

Experience: TORAY Industries, Inc. (1990-present)

Virginia Polytech Institute & State University (Timothy E. Long) (2000-2002)

Research Fellow (2009-present)

Selected Representative Publications:

1. Yamauchi, K.; Lizotte, J. R.; Long, T. E. *J. Am. Chem. Soc.* **2002**, 24, 29,8599,
2. Yamauchi, K.; Lizotte, J. R.; Long, T. E. *Macromolecules* **2002**, 35, 8745.
3. Yamauchi, K.; Lizotte, J. R.; Long, T. E. *Macromolecules* **2003**, 36, 108.
4. Yamauchi, K.; Kanomata, A.; Inoue, T.; Long, T. E. *Macromolecules* **2004**, 36, 1083.
5. Yokoe, M.; Yamauchi, K.; Long, T. E. *J. Polym. Sci. Part A: Polym. Chem.* **2016** DOI:10.1002/pola.28101.

CURRICULA VITAE

FOR

SEMINAR STAFF

Curriculum Vitae

Name: **NAOKI OUSAKA**

Date of Birth: April 20, 1978

Title: Associate Professor

Affiliation: Nagoya University, Graduate School of Engineering,
Department of Molecular Design and Engineering
Chikusa-ku, Nagoya 464-8603, Japan

Telephone, Fax, E-mail, Website: TEL +81-52-789-4667, FAX +81-52-789-3185
ouaka@apchem.nagoya-u.ac.jp; http://helix.mol.nagoya-u.ac.jp/e/index.html

Education:

BS	Nagoya Institute of Technology, 2002
Ph.D	Nagoya Institute of Technology, 2007
Postdoc	JST ERATO-SORST Kuroda chiromorphology project (Reiko Kuroda), 2007-2009. Nagoya University (Eiji Yashima), 2009-2014. University of Cambridge (Jonathan R. Nitschke), 2011-2012.

Current Appointments:
Nagoya University, Associate Professor (2014 - present)

Research Interests:
Synthesis of Helical Molecules, Supramolecules, and Polymers with Novel Structures and Functions

Selected Representative Publications:

1. Suzuki Y.; Nakamura, H.; Iida, H.; Ousaka, N.; Yashima, E. "Allosteric Regulation of Unidirectional Spring-like Motion of Double-Stranded Helicates" *J. Am. Chem. Soc.* **2016**, *138*, 4852-4859.
2. Mamiya, F.; Ousaka, N.; Yashima, E. "Remote Control of the Planar Chirality in Peptide-Bound Metallomacrocycles and Dynamic-to-Static Planar Chirality Control Triggered by Solvent-Induced 3_{10}-to-α-Helix Transitions" *Angew. Chem., Int. Ed.,* **2015**, *54*, 14442-14446.
3. Ousaka, N.; Takeyama, Y.; Yashima, E. "Anion-Driven Reversible Switching of Metal-Centered Stereoisomers in Metallopeptides" *Chem.−Eur. J.* **2013**, *19*, 4680-4685.
4. Ousaka, N.; Grunder, S.; Castilla, A. M.; Whalley, A. C.; Stoddart, J. F.; Nitschke, J. R. "Efficient Long-Range Stereochemical Communication and Cooperative Effects in Self-Assembled Fe_4L_6 Cages" *J. Am. Chem. Soc.* **2012**, *134*, 15528.
5. Ousaka, N.; Takeyama, Y.; Iida, H.; Yashima, E. "Chiral Information Harvesting in Dendritic Metallopeptides" *Nat. Chem.* **2011**, *3*, 856-861.

Curriculum Vitae

Name: **DAISUKE TAURA**

Date of Birth: September 12, 1981

Title: Assistant Professor

Affiliation: Nagoya University, Graduate School of Engineering,
Department of Molecular Design and Engineering
Chikusa-ku, Nagoya 464-8603, Japan

Telephone, Fax, E-mail, Website: TEL +81-52-789-3186, FAX +81-52-789-3185
taura@apchem.nagoya-u.ac.jp; http://helix.mol.nagoya-u.ac.jp/e/index.html

Education:

B.S.	Nagoya University, 2004
Ph.D.	Osaka University, 2010
Postdoc	ETH Zürich (François Diederich), 2010 - 2011

Current Appointments:
Nagoya University, Assistant Professor (2011 - present)

Research Interests:
Synthesis of Helical Molecules, Supramolecules, and Polymers with Novel Structures and Functions

Selected Representative Publications:

1. Makiguchi, W.; Tanabe, J.; Yamada, H.; Iida, H.; Taura, D.; Ousaka, N.; Yashima, E. "Chirality- and Sequence-Selective Successive Self-Sorting via Specific Homo- and Complementary-Duplex Formations", *Nature Commun.* **2015**, *6*, doi:10.1038/ncomms8236.
2. Taura, D.; Min, H.; Katan, C.; Yashima, E. "Synthesis of a Double-Stranded Spiroborate Helicate Bearing Stilbene Units and Its Photoresponsive Behaviour" *New J. Chem.* **2015**, *39*, 3259-3269.
3. Horie, M.; Ousaka, N.; Taura, D.; Yashima, E. "Chiral Tether-Mediated Stabilization and Helix-Sense Control of Complementary Metallo-Double Helices" *Chem. Sci.* **2015**, *6*, 714-723.
4. Tanabe, J.; Taura, D.; Yamada, H.; Furusho, Y.; Yashima, E. "Photocontrolled Template-Directed Synthesis of Complementary Double Helices Assisted by Amidinium-Carboxylate Salt Bridge Formation" *Chem. Sci.* **2013**, *4*, 2960-2966.
5. Breiten, B.; Jordan, M.; Taura, D.; Zalibera, M.; Griesser, M.; Confortin, D.; Boudon, C.; Gisselbrecht, J.-P.; Schweizer, W. B.; Gescheidt, G.; Diederich, F. "Donor-Substituted Octacyano[4]dendralenes: Investigation of π-Electron Delocalization in Their Radical Ions" *J. Org. Chem.* **2013**, *78*, 1760-1767.