Prof Hui-Ming Cheng

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Prof Huiming Cheng received his PhD in Materials Science from the Institute of Metal Research, Chinese Academy of Sciences in 1992 and then joined Nagasaki University as a Research Associate of Engineering. In 1994, he returned to the Institute of Metal Research, Chinese Academy of Sciences and is currently the Professor. He has also been the Director and Professor of the Advanced Carbon Division of Shenyang National Laboratory for Materials Science since 2001.

Prof Cheng's research focuses on synthesis, characterization and applications of carbon nanotubes, graphene and other low-dimensional materials. He also works on the design and synthesis of nanostructured materials for clean energy applications; exploration of photochemically active materials for water-splitting and CO2 conversion and fabrication and applications of high-performance bulk carbon materials such as isotropic pyrolytic carbon and C/C composites.

Prof Cheng was elected the Academician of Asia-Pacific Academy of Materials and Chinese Academy of Sciences, both in 2013. He was also elected the Fellow of the World Academy of Sciences in 2014. He received numerous awards including the 2nd class Chinese National Natural Science Award (Synthesis and Study of Single-Walled and Double-Walled Carbon Nanotubes) (2006); the Charles E. Pettinos Award by the American Carbon Society (2010) and Award for Scientific and Technological Progress (2nd class) of Chinese Ministry of Industry and Information Technology (2012), The Utz-Hellmuth Felcht Award, SGL Group, Germany (2015) and The 1st class Natural Science Award of Liaoning Province (Synthesis and Application Explorations of Graphene Materials), China (2015). He published over 400 papers with more than 20000 citations. He is the Editor of Carbon since 2000 and has given more than 70 plenary/keynote/invited talks in international conferences and symposia.

Graphene Materials: Fabrication and Use in Electrochemical Energy Storage

Abstract:

Electrochemical energy storage devices, in particular, supercapacitors, lithium-ion batteries and lithium-sulfur batteries, have been extensively explored. Graphene with different structures and functionalities plays a key role in these energy storage devices for use as electrodes, conductive fillers, coating layers, etc. We have fabricated different types of graphene materials, such as graphene oxide (GO), reduced GO, graphene nanosheets, graphene films and single crystal domains, and 3D graphene networks, by chemical exfoliation and chemical vapor deposition, and from them we have prepared various graphene-based hybrid electrode materials by mechanical mixing, coating, hydrothermal deposition, and *in-situ* synthesis for supercapacitors, lithium ion and lithium-sulfur batteries. These hybrid electrode materials showed desirable electrochemical properties in terms of long cycling life, good high rate capability, and high reversible capacity. Using graphene in flexible energy storage devices is another emerging field, and we have also explored several kinds of graphene-based flexible electrodes. For example, by coating active materials on a graphene foam-like structure synthesized by CVD, a thin, lightweight and flexible lithium ion battery was assembled to show high rate capability and capacity, and excellent flexibility.