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A GLOSSARY OF URANIUM-
AND THORIUM-BEARING MINERALS

By

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and
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INTRODUCTION

The U. S. Geological Survey has for some time been making a systematic survey of data pertaining to uranium and thorium minerals and to those minerals that contain traces or more of uranium and thorium. This survey consists of collecting authoritative chemical, optical, and X-ray diffraction data from the literature and of adding to these data, where inadequate, by work in the laboratory. The results will be reported from time to time, and the authors welcome information on additional data and names.

The first of a series of reports on these results is this glossary of uranium- and thorium-bearing minerals. This project is part of the work on radioactive materials being done by the Geological Survey on behalf of the Atomic Energy Commission. The glossary is divided into four groups: A, minerals containing uranium and thorium as major constituents; B, minerals containing minor amounts of uranium and thorium; C, minerals that, if investigated by modern analytical methods, might show uranium or thorium content; and D, minerals that are non-uranium- or non-thorium-bearing, but that have been reported to contain impurities or intergrowths of uranium, thorium, or rare-earth minerals. Uranium is more widespread in its natural occurrence than generally has been supposed, and it is possible that the third group of minerals will give valuable information upon reinvestigation.

Such a glossary has long been needed to alleviate the confusion that obscures the nomenclature of these minerals. For many of them the confusion will remain until more thorough research is done. Some species always may be subject to question as their type specimens have been lost and existing specimens bearing the species name have been found to be other substances (e.g., in group A, uranochalcite and voglianite). Structural formulas are given for most of the minerals. Oxide formulas are given where no good structural data are available. The glossary summarizes the state of our knowledge, as of March 1950, concerning the validity of all the included species. Identities and group relations are indicated. It might be well to relegate to obscurity the many synonyms existing in the literature.

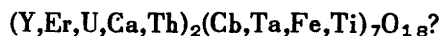
In the index there are 325 entries that represent 81 species containing uranium and thorium as major constituents, 39 species containing small amounts of uranium and thorium, 29 species that should be tested for uranium and thorium, and 13 species that have been reported to contain impurities or intergrowths of uranium, thorium, or rare-earth minerals. These four categories are shown in the index by reference letters.

For most of the minerals a reference has been chosen from standard reference books and easily available journals. Dana VI and Dana VII stand for the 6th and 7th editions, respectively, of Dana's System of Mineralogy.

The authors wish to thank Dr. Clifford Frondel of the Department of Mineralogy and Petrography, Harvard University, and Professor Esper S. Larsen, Jr., of the U. S. Geological Survey, for their suggestions and critical reading of the manuscript.

A. URANIUM AND THORIUM MINERALS

AMPANGABEITE



Validity of species is questionable; may be an inhomogeneous alteration product.

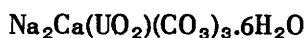
U = 17.1%, Th = 1.8%.

Dana VII, pp. 806-807

Hydroeuxenite, a synonym of ampangabeite.

Dana VII, p. 806.

ANDERSONITE



U = 39.15%

Milton, C., U. S. Geol. Survey, personal communication.

AUTUNITE



U = 49.7 to 56.2%

Dana VI, pp. 857-858

Calcouranite, a synonym of autunite.

Meta-autunite is the hydrate with $8H_2O$.

BASSETITE



U = 51%

Mineralog. Mag., vol. 17, pp. 221-236, 1915

Chemie der Erde, vol. 12, pp. 433-450, 1939-40.

Fron del, C., Harvard University, personal communication.

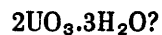
BAYLEYITE



U = 27.8 to 29.2%.

Milton, C., U. S. Geol. Survey, personal communication.

BECQUERELITE



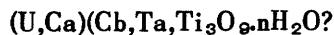
U = 82.4%

Dana VII, pp. 625-627

Billietite, a variety of becquerelite.

Am. Mineralogist, vol. 33, pp. 503-507, 1948.

BETAFITE



U = 16.3 to 24.5%.

Th = 1.0 to 1.1%

Dana VII, pp. 803-805

Blomstrandite, a synonym of betafite.

U = 16.3%

Dana VII, pp. 803-805.

Mendeleevite, titanian betafite.

U = 13.7%.

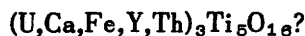
Dana VII, pp. 803-804.

Samiresite, a synonym of betafite.

U = 18.7%

Dana VII, pp. 803-805.

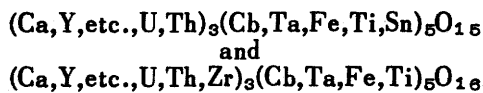
BRANNERITE



U = 39.3%, Th = 3.6%

Dana VII, pp. 774-775.

CALCIOSAMARSKITE

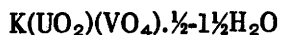


U = 9.4 to 11.3%

Th = 1.9 to 2.9%

Dana VII, p. 772

CARNOTITE



U = 56.3 to 58.4%

Dana VI, Appendix I, pp. 13-14

CLARKEITE



U = 73.7%

Dana VII, pp. 624-625

CUPROSKLODOWSKITE



U = 58.6%

Am. Mineralogist, vol. 19, p. 235, 1934

Jachymovite = cuprosklodowskite

Mineralog. Abs., vol. 6, p. 345, 1936

Uranochalcite - a hydrous copper, uranium, and calcium sulfate of questionable validity.

Voglianite - A hydrous calcium and uranium sulfate of questionable validity. The type material of Vogl for uranochalcite and voglianite has not been found. Present museum specimens bearing these names have proved to be cuprosklodowskite:

Vogl, J. F., Gangverhältnisse und Mineralreichtum Joachimthals, Teplitz, 1857

České Spol. Nauk Vestník, article VII, pp. 1-36, 1935

CURITE

$Pb_2U_5O_{17} \cdot 4H_2O$

U = 66.2 to 70.1%

Dana VII, pp. 629-631

DELORENZITE

$(Y,U,Fe^2)(Ti,Sn)_3O_8$

U = 8.7%

Dana VII, p. 808

DEWINDTITE

$Pb(UO_2)_2(PO_4)_2 \cdot 3H_2O$

U = 52.1%

Am., Mineralogist, vol. 7, p. 162, 1922

Stasite = dewindite? -

$Pb_4U_8P_6O_{43} \cdot nH_2O$

Am. Mineralogist, vol. 7, pp. 196-197, 1922

DIDERICHITE

Contains uranium, water, and carbonate.

Validity of species is questionable.

Soc. belge geologie Bull., vol. 70, pp. 212-225, 1947

DJALMAITE

$(U,Ca,Pb)(Ta,Cb,Ti)_3O_9 \cdot nH_2O$

May be tantalum equivalent of betafite. May be microlite; Tavora, E., University of Brazil, personal communication, Oct. 1949

U = 10.4%

Dana VII, p. 805

DROOGMANSITE

No chemical analysis has been made. May be related to sklodowskite.

Am. Mineralogist, vol. 11, p. 168, 1926

DUMONTITE

$Pb_2(UO_2)_3(PO_4)_2O_2 \cdot 5H_2O$

U = 51.0%

Am. Mineralogist, vol. 10, p. 131, 1925

EPIANTHINITE

$yUO_3 \cdot xH_2O$

No good chemical analysis has been made. An alteration product of ianthinite.

Am. Mineralogist, vol. 32, pp. 344-350, 1947

ESCHYNITE

$(Ce,Ca,Fe?,Th)(Ti,Cb)_2O_6$

Also aeschynite. In eschynite-priorite series.

Th = 9.9 to 15.4%

Dana VII, pp. 793-796

EUXENITE

$(Y,Ca,Ce,U,Th)(Cb,Ta,Ti)_2O_6$

In euxenite-polycrase series.

U = 3.0 to 9.0%

Th = up to 4.3%

Dana VII, pp. 787-791

Lyndochite - variety of euxenite

U = 0.6%, Th = 4.3%

Dana VII, pp. 787, 789-791

Tanteuxenite - variety of euxenite

U = 3.0 to 3.8%, Th = tr.

Dana VII, pp. 787, 789-790

Eschwegite - AB_2O_6

A = Y,Er,U,Th

B = Cb,Ta,Ti,Fe

U = 1.7%, Th = 0.5%

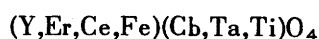
May belong to euxenite-polycrase series.

Dana VII, pp. 792-793

Toddite - possibly a mixture of columbite and euxenite.

U = 9.8%, Th = 0.4%

Dana VII, pp. 785-786

FERGUSONITE

In fergusonite-formanite series.

U = 0.8 to 6.3%

Th = 0.7 to 2.5%

Dana VII, pp. 757-762.

Adelpholite - synonym of fergusonite? A poorly defined substance, possibly an altered mossite.

Dana VII, pp. 762, 778-779

Arrhenite - an altered fergusonite

Dana VII, p. 762

Bragite - synonym of fergusonite

U = 7.2%

Dana VII, pp. 757, 759, 761

Kochelite - synonym of fergusonite

Dana VII, pp. 757, 761

Risörite - synonym of fergusonite

U = 0.09%, Th = tr.

Dana VII, pp. 757-758, 760-762

Rutherfordite - an altered fergusonite

Dana VII, pp. 757, 761-762

Sipylite - synonym of fergusonite

U = 0.8 to 6.3%

Dana VII, pp. 757, 759-760, 762

Tyrite - synonym of fergusonite

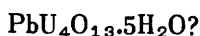
Dana VII, pp. 757, 760-761

FORMANITE

In fergusonite-formanite series.

U = 1.1%, Th = 1.1%

Dana VII, pp. 758, 760, 762

FOURMARIERITE

U = 70.1 to 70.8%

Dana VII, pp. 628-629

FRITZSCHEITE

No actual analysis is available. May be the manganese analogue of torbernite.

Dana VI, p. 860

GUMMITE

Generic term for minerals occurring as alteration products of uraninite and not otherwise identified. Group includes silicates, phosphates, and oxides.

U = 31.3 to 70.1%

Th = up to 22.0%

Dana VII, pp. 622-625

Eliasite - synonym of gummite

U = 57.2%

Dana VII, pp. 622-624

Pittinite - synonym of gummite

Dana VII, pp. 622-624

Yttrogummite - synonym of gummite

Alteration product of yttrian uraninite.

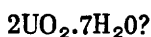
Dana VII, pp. 622-624

HUTTONITE

Monoclinic dimorph of thorite.

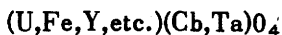
Th = 67.4%

U = none

Pabst, Adolf, University of California, personal communication; in press *Am. Mineralogist*.**IANTHINITE**

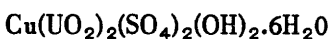
U = 70.3%

Dana VII, pp. 633-634

ISHIKAWAITE

U = 19.3%

Dana VII, p. 766

JOHANNITE

U = 55.3 to 61.1%

Am. Mineralogist, vol. 11, pp. 1-5, 1926

Gilpinite = johannite

Am. Mineralogist, vol. 11, pp. 1-5, 1926

KASOLITE

$Pb(UO_2)SiO_4 \cdot H_2O$

U = 43.6 to 44.5%

Am. Mineralogist, vol. 7, pp. 128-129,
1922

KHLOPINITE

$(Y, U^4, Th)_3(Cb, Ta, Ti, Fe)_7O_{20}?$

Also chlopinite, hlopinite

May be related to euxenitepolycrase series.

U = 7.2%, Th = 1.9%

Dana VII, p. 792

LIEBIGITE

$Ca_2(UO_2)(CO_3)_3 \cdot 10H_2O?$

U = 34.3%

Dana VI, p. 308

Uranothallite - synonym of liebigite

Frondel, C., Harvard University, personal communication.

Flutherite - synonym of uranothallite

Dana VI, p. 307

MACKINTOSHITE

$(Th, U)SiO_4 \cdot H_2O?$

U = 19.7%, Th = up to 39.9%

Dana VI, appendix I, p. 44

Hydrothorite

$ThSiO_4 \cdot 4H_2O$

Alteration product of mackintoshite.

U = 1.9%, Th = 50.7%

Am. Mineralogist, vol. 13, p. 570, 1928

Pilbarite

$UO_3 \cdot PbO \cdot ThO_2 \cdot 2SiO_2 \cdot 4H_2O$

Alteration product of mackintoshite;
close to thorogummite.

U = 24.4%, Th = 27.4%

Am. Mineralogist, vol. 13, pp. 464-465,
1928

MAITLANDITE

$(U, Th, Pb)SiO_4 \cdot 3H_2O?$

U = 31.2%, Th = 22.7%

Am. Mineralogist, vol. 16, p. 472, 1931

Nicolayite - alteration product of maitlandite; close to thorogummite.

U = 33.7%, Th = 21.4%

Am. Mineralogist, vol. 16, p. 409, 1931

MASUYITE

Hydrated lead uranium oxide.

Validity of species is questionable.

Soc. belge géologie Bull., vol. 70,
pp. 212-225, 1947

MEDJIDITE

Sulfate of uranium and calcium.

Validity of species is questionable.

Dana VI, p. 978

MONAZITE

Essentially $(Ce, La, Nd, Pr)PO_4$ containing ThO_2 and SiO_2

Th = 8% commonly; but up to 26% is reported, Davidson, C. F., Geol. Survey Great Britain, personal communication.

Dana VI, pp. 749-752

Cryptolite - synonym of monazite

Dana VI, pp. 749, 752

Edwardsite - synonym of monazite

Dana VI, p. 749

Eremite - synonym of monazite

Dana VI, pp. 749, 752

K  rarfveite - impure monazite

Dana VI, p. 752

Mengite - synonym of monazite

Dana VI, p. 749

Monazitoid - synonym of monazite

Dana VI, p. 749

Phosphocerite - synonym of monazite

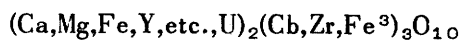
Dana VI, p. 749

Tumerite - synonym of monazite

Dana VI, pp. 749, 751-752

Urdite - synonym of monazite

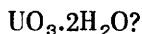
Dana VI, pp. 749, 752

NOHLITE

Validity of species is questionable.

U = 13.0%

Dana VII, p. 772

PARASCHOEPIE

U = 80.5%

Am. Mineralogist, vol. 32, pp. 344-350,
1947**PARSONSITE**

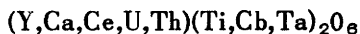
U = 26.8%

Am. Mineralogist, vol. 8, p. 150, 1923

PHOSPHURANYLITE

A lead, calcium, uranium phosphate.

U = 57.3%

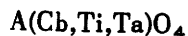
Fron del, C., Harvard University, personal
communication**POLYCRASE**

In euxenite-polycrase series.

U = 5.5 to 12.4%

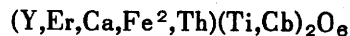
Th = up to 4.7%

Dana VII, pp. 787-791

POLYMIGNYTEA = Ca, Fe², Y, Zr, Th

Th = 3.4%

Dana VII, pp. 764-766

PRIORITE

In eschynite-priorite series.

U = 0.4 to 3.4%

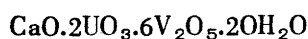
Th = 0.5 to 14.9%

Dana VII, pp. 793-796

Blomstrandine - synonym of priorite

Also, blomstrandinite

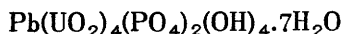
Dana VII, pp. 793-796

RAUVITE

U = 21.4%

Am. Mineralogist, vol. 8, p. 187, 1923

U. S. Geol. Survey Bull. 750, pp. 68-70, 1935

RENARDITE

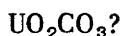
U = 58.5%

Am. Mineralogist, vol. 14, p. 244, 1929

RICHETITE

Contains Pb and U.

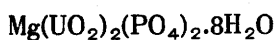
Validity of species is questionable.

Soc. belge géologie Bull., vol. 70,
pp. 212-225, 1947**RUTHERFORDINE**

Validity of species is questionable.

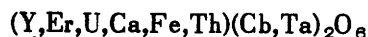
U = 72.1%

Mineralog. Mag., vol. 14, p. 409, 1907

SALÉEITE

U = 58.4%

Am. Mineralogist, vol. 19, p. 36, 1934

SAMARSKITE

U = 8.4 to 16.1%

Th = up to 3.7%

Dana VII, pp. 797-800

Annerödite - mixture of samarskite and
parallel growths of columbite.

Dana VII, pp. 797, 799

Eytlandite - synonym of samarskite

Dana VII, p. 797

Hydrosamarskite - an altered samarskite

Dana VII, pp. 799-800

Plumboniobite - a columbate of Y, U, Pb, Fe, etc.

May be a plumbian variety of samarskite.

Dana VII, p. 800

Rogersite - synonym of samarskite

Dana VII, p. 800

Uranotantalite - synonym of samarskite

Dana VII, p. 797

Vietinghofite - synonym of samarskite

Dana VII, pp. 800-801

Yttrio-ilmenite - synonym of samarskite

Dana VII, p. 797

SCHOEPITE

$4\text{UO}_3 \cdot 9\text{H}_2\text{O}?$

U = 79.0%

Am. Mineralogist, vol. 8, pp. 67-69, 1923

SCHROECKINGERITE

$\text{Ca}_3\text{NaUO}_2(\text{CO}_3)_3(\text{SO}_4)\text{F} \cdot 10\text{H}_2\text{O}$

U = 29.0%

Am. Mineralogist, vol. 33, pp. 152-157, 1948

Dakeite - synonym of schroeckingerite

SENGIERITE

$\text{Cu}_2(\text{UO}_2)_2(\text{VO}_4)_2 \cdot 10\text{H}_2\text{O}?$

U = 47.2%

Am. Mineralogist, vol. 34, pp. 109-120, 1949

SHARPITE

$6\text{UO}_3 \cdot 5\text{CO}_2 \cdot 8\text{H}_2\text{O}?$

Composition needs to be checked.

U = 73.1%

Am. Mineralogist, vol. 24, p. 658, 1939

SKLODOWSKITE

$\text{Mg}(\text{UO}_2)_2\text{Si}_2\text{O}_7 \cdot 7\text{H}_2\text{O}$

U = 58.4%

Am. Mineralogist, vol. 10, p. 132, 1925

Chinkolobwite - synonym of sklodowskite

Am. Mineralogist, vol. 9, p. 156, 1924

SODDYITE

$5\text{UO}_3 \cdot 2\text{SiO}_2 \cdot 6\text{H}_2\text{O}?$

U = 77.0%

Mineralog. Abs., vol. 3, p. 371, 1927

STUDTITE

A hydrated carbonate of U and Pb. Validity of species is questionable.

Soc. belge géologie Bull., vol. 70, pp. 212-225
1947

SWARTZITE

$\text{CaMgUO}_2(\text{CO}_3)_3 \cdot 12\text{H}_2\text{O}$

U = 33.6%

Milton, C., U. S. Geol. Survey, personal communication

THORIANITE

$(\text{Th}, \text{U})\text{O}_2$

Forms series with uraninite

U = 15.9 to 39.0%

Th = 33.7 to 81.5%

Dana VII, pp. 620-622

Uranothorianite = uranium-rich member of series

THORITE

ThSiO_4

U = up to 9.0%

Th = 25.2 to 62.7%

Dana VI, pp. 488-489

Auerlite - phosphatian variety of thorite

Th = 60.7 to 61.5%

Dana VI, pp. 488-490

Calciothorite - variety of thorite

Th = 52.3%

Dana VI, p. 489

Enalite - uranoan thorite

U = 9.4%, Th = 25.4%

Am. Mineralogist, vol. 18, p. 223, 1933

Eucrasite - variety of thorite

Th = 31.6%

Dana VI, p. 489

Ferrothorite - a ferrian thorite

U = 2.4%, Th = 54.0%

Am. Mineralogist, vol. 14, p. 78, 1929

Freyalite - variety of thorite

Th = 25.2%

Dana VI, p. 489

Hyblite - (both alpha and beta) - hydrous basic sulfo-silicate of Th, with minor U, Fe, and Pb. An alteration product of thorite.

Am. Mineralogist, vol. 12, pp. 368-372, 1927

Orangite - synonym of thorite

U = 1.0%, Th = 62.7%

Dana VI, pp. 488-489

Uranothorite - uranoan thorite

U = 7.4 to 13.9%

Th = 38.2 to 42.3%

Dana VI, pp. 488-489

THOROGUMMITE

(Th,U)SiO₄·6H₂O?

Compare pilbarite and nicolayite, p. 14.

U = 20.2%, Th = 36.3%

Dana VI, p. 893

Chlorothorite - synonym of thorogummite

Dana VI, p. 893

THOROTUNGSTITE

3WO₃·ThO₂·4H₂O?

Th = 14.0%

Am. Mineralogist, vol. 13, p. 159, 1928

TORBERNITE

Cu(UO₂)₂(PO₄)₂·8-12H₂O

U = 51.2 to 56.0%

Dana VI, pp. 856-857

Chalcolite - synonym of torbernite

Cupro-uranite - synonym of torbernite

Metachalcolite - synonym of metatorbernite

Metatorbernite

Cu(UO₂)₂(PO₄)₂·8H₂O

U = 56%

Mineralog. Mag., vol. 17, pp. 326-339, 1916

Uranite = torbernite-autunite group

Dana VI, pp. 856-857

Uranophyllite - synonym of torbernite

TRÖGERITE

(UO₂)₃(AsO₄)₂·12H₂O

U = 57.5%

Dana VI, pp. 859-860

TYUYAMUNITE

Ca(UO₂)₂(VO₄)₂·nH₂O

n = 9-10, but may be down to 4

U = 47.1 to 59.0%

Am. Mineralogist, vol. 12, p. 382, 1927

Calciocarnotite - synonym of tyuyamunite

Ferghanite - probably identical with tyuyamunite, but original descriptions indicate minerals may be different.

Frondel, C., Harvard University, personal communication

URACONITE

Hydrous sulfate of U and Cu.

U = 61.0%

Dana VI, p. 978

Uranocher - synonym of uraconite

URANINITE

UO₂ (between UO₂ and U₃O₈, with U⁴ predominant)

U = 46.4 to 97.6%

Th = up to 12.2%

Dana VII, pp. 611-620

Bröggerite

Thorian uraninite (U,Th)O₂

U = 68.3%, Th = 5.3%

Dana VII, pp. 611-614

Cleveite - uraninite with rare earths

U = 57.0%, Th = 4.0%

Dana VII, pp. 611, 613-614

Coracite - synonym of uraninite

Dana VII, pp. 611, 615, 617

Nasturan - synonym of pitchblende

Dana VII, pp. 611, 614, 617

Nivenite - uraninite with rare earths

U = 57.8%, Th = 5.9%

Dana VII, pp. 611, 613-615, 617

Pitchblende - colloform and massive uraninite

U = 56.9 to 82.9%

Dana VII, pp. 611-619

Ulrichite - synonym of uraninite

Dana VII, pp. 611, 613, 617

Uranoniobite - synonym of uraninite

Dana VII, pp. 611, 613

Uranopissite - synonym of uraninite

URANOCIRCITE



Barium analogue of autunite

U = 51.3%

Dana VI, p. 859

URANOPHANE



U = 48.1 to 60.4%

Dana VI, p. 699

Beta-uranophane - polymorph of uranophane

Nováček, R., *České Spol. Nauk Věstník*,
article VII, pp. 1-36, 1935

Lambertite - synonym of uranophane

Am. Mineralogist, vol. 11, pp. 155-157, 1926

Randite - a mixture of beta-uranophane, some tyuyamunite, and calcite.

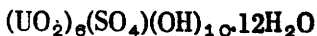
Frondel, C., Harvard University, personal communication

Uranotil - synonym of uranophane

U = 56.7 to 60.2%

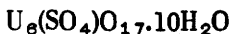
Dana VI, p. 699

URANOPILITE



U = 69.6 to 69.9%

Beta-uranopilite



Nováček, R., *České Spol. Nauk Věstník*,
article VII, pp. 1-36, 1935

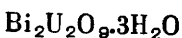
URANOSPATHITE

Hydrated uranyl phosphate?

Composition unknown

Mineralog. Mag., vol. 17, pp. 221-236, 1915

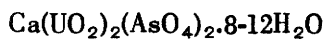
URANOSPHAERITE



U = 45.9 to 43.3%

Dana VII, p. 631

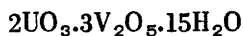
URANOSPINITE



U = 53.4%

Dana VI, pp. 858-859

UVANITE

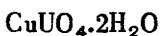


U = 32.9%

Mineralog. Mag., vol. 17, p. 359, 1916

Washington Acad. Sci. Jour., vol. 4,
p. 576, 1914

VANDENBRANDEITE



U = 63.5 to 64.3%

Dana VII, pp. 632-633

Uranolepidite - synonym of vandenbrandeite

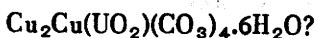
Am. Mineralogist, vol. 19, pp. 235-236, 1934

VANDENDRIESSCHEITE

Hydrous lead uranium oxide Validity of
species is questionable.

Soc. belge géologie Bull., vol. 70, pp. 212-225,
1947

VOGLITE



U = 34.7%

Dana VI, p. 308

WALPURGITE



U = 13.5 to 17.0%

Dana VI, p. 860; *Neues Jahrb.*, 44, Abt. A,
1948; Evans, H. T., personal communication,
1949

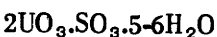
ZEUNERITE



U = 50.4%

Dana VI, p. 857

ZIPPEITE



U = 64.9 to 67.4%

Dana VI, p. 978

B. MINERALS WITH MINOR AMOUNTS OF URANIUM AND THORIUM

ALLANITE

$(Ca,Ce,Th)_2(Al,Fe,Mg)_3Si_3O_{12}(OH)$

U = 0.017%, Th = up to 3.2%

Dana VI, pp. 522-526

Nagatelite - phosphatian variety of allanite

Th = 0.8%

Am. Mineralogist, vol. 16, pp. 343-344, 1931

Orthite - synonym of allanite

Ytthro-orthite (also, yttrium orthite) - synonym of allanite

Mineralog. Mag., vol. 23, p. 639, 1934

ANTHRAXOLITE

A hydrocarbon, nickeliferous and uraniumiferous; compare kolm and thucolite.

U = 0.0029%

Am. Mineralogist, vol. 19, pp. 426-428, 1934

Asphaltite, *broggite*, and *carburan* are similar materials

BASTNAESITE

$(Ce,La)FCO_3$

U and Th present but less than 1%.

U. S. Geol. Survey, manuscript report; Dana VI, p. 291

CAPPELENITE

$(Ba,Y)_2SiBO_6$

Th = 0.42%

Dana VI, pp. 413-414

CERITE

Ce_2SiO_6

U = 0.4%, Th = 0.3%

Am. Mineralogist, vol. 25, pp. 381-404, 1940

CHINGLUSUITE

A complex silicate of Na, Mn, Ca, and Ti.

Th = 0.05%

Acad. sci. URSS Bull., pp. 153-157, 1938

CORDYLITE

$Ce_2BaF(CO_3)_3$

Th = up to 0.27%

Dana VI, appendix II, p. 31

CORVUSITE

$V_2O_4 \cdot 6V_2O_5 \cdot xH_2O?$

Validity of species is questionable.

U = 1.0 to 2.8%

Am. Mineralogist, vol. 18, pp. 195-205, 1933

DAVIDITE

Contains Ti, Fe, rare earths, U, V, and Cr.

U = 8.1%, Th = 0.12%

Dana VII, p. 542; Royal Soc. S. Australia Trans., vol. 68, p. 334, 1944

FERSMITE

$(Ca,Ce,Na)(Cb,Ti,Fe,Al)_2(O,OH,F)_6$

Th = 0.42%

Acad. sci. URSS, C. R., 52, pp. 69-71, 1946

HJELMITE

AB_2O_6 or $A_2B_3O_{10}$

Also hjelmitite.

A = Y, Fe², U⁴, Mn, Ca

B = Cb, Ta, Sn, W

U = 4.0 to 4.3%

Dana VII, pp. 779-780

HOKUTOLITE

Variety of barite. Radioactive mixture of Pb and Ba sulfate. Probably contains Ra, Th, and U.

Mineralog. Mag., vol. 16, p. 362, 1913

Anglesobarite - synonym of hokutolite

JOHNSTRUPITE

A complex silicate of Na, Ca, Th, Ce, and Ti.

Th = 0.7%

Dana VI, pp. 720-721

KOLM

Rock with hydrocarbon and uranium. Form in which uranium is present is unknown.

U = 0.44%

Am. Chem. Soc. Jour., vol. 52, pp. 4848-4851, 1930

See also anthroxolite and thucolite.

LOVOZERITE

Complex silicate of Ti and Zr.

Th = 0.50%

Acad. sci. URSS, C. R. 25, p. 735, 1939

MELANOCERITE

Chiefly a boro-silicate of the Ce and Y metals.

Th = 1.5%

Dana VI, pp. 414-415

Caryocerite - near melanocerite

Th = 12.0%

Dana VI, p. 415

MICROLITE

$(\text{Na,Ca})_2(\text{Ta,Cb})_2\text{O}_6(\text{O,OH,F})$

In pyrochlore-microlite series.

U = up to 5.1%, Th = 0.2%

Dana VII, pp. 748-754

Calciotantalite - possibly a mixture of microlite and tantalite.

Dana VII, p. 787

Haddamite - synonym of microlite

Dana VII, p. 748

Metasimpsonite - an alteration product of simpsonite, later identified with microlite.

Dana VII, p. 755

Neotantalite - an altered microlite with composition close to tantalite.

U = tr.

Dana VII, pp. 748, 750-751, 753

MOSANDRITE

Complex silicate of Na,Ca,Ce, and Ti.

Th = 0.3%

Dana VI, pp. 721-722; Also, Zentralbl. Mineralogie, 1934, Abt. A, pp. 76-79,

PISEKITE

Essentially a columbate-tantalate-titanate of U and rare earths, with Th and Sn. No quantitative analysis available. May be related to ampingabeite.

Dana VII, pp. 807-808

PYROCHLORE

$(\text{Na,Ca})_2(\text{Cb,Ta})_2\text{O}_6\text{F}$

In pyrochlore-microlite series.

U = up to 14.0%

Th = up to 4.4%

Dana VII, pp. 748-754

Azorite - synonym of pyrochlore

Chalcolamprite - synonym of pyrochlore

Dana VII, pp. 748, 750, 754

Ellsworthite = composition is close to pyrochlore, but analyses show it is relatively high in U and H₂O and low in alkalis.

U = 17.1%

Dana VII, pp. 748, 750-752

Endeolite - similar in composition to chalcolamprite. An altered pyrochlore?

Dana VII, pp. 748, 754

Hatchettolite - uranian pyrochlore

U = 14.0%, Th = 0.5%

Dana VII, pp. 748, 750-752

Koppite - synonym of pyrochlore

Dana VII, pp. 748, 750, 752

Marignacite - synonym of pyrochlore

Th = 0.2%

Dana VII, pp. 748, 750-752

Pyrrhite - synonym of pyrochlore

Dana VII, pp. 748, 752, 754

RINKITE

Complex silicate of Na,Ca,Ce, and Ti.

Th = small amounts

Dana VI, p. 722

Kondrikite - a mixture of rinkite and zeolite; synonym of kondrikovite.

Lovchorrite - alteration product of rinkite?

U = up to 0.01%

Th = up to 0.7%

Yudyavrite - alteration product of rinkite.

Th = about 1%

RINKOLITE

Complex silicate of Na,Ca,Ce, and Zr.

Th = up to 0.41%

Am. Mineralogist, vol. 11, p. 289, 1926
Acad. s. URSS Bull. 20, p. 1181, 1926

ROWLANDITE

An yttrium silicate.

U = 0.4%

Dana VI, p. 1047

STEENSTRUPINE

Complex silicate of rare earths, Th,Na,K,Fe,
Mn,Mg,P,Be,Al, and Ta, with (OH) and F.

Th = 6.2%

Dana VI, p. 415, Also, Neues Jahrb., Beilage-
Band 64, Abt. A, pp. 235-249, 1931

TENGERITE

$\text{CaY}_3(\text{CO}_3)_4(\text{OH})_3 \cdot 3\text{H}_2\text{O}?$

Alteration product of yttrialite.

Th = 0.3%

Sci. Papers Inst. Phys. Chem. Res. (Tokyo),
vol. 34, pp. 832-841, 1938

The originally described *tengerite*, Dana VI,
pp. 306-307, is a different mineral, suppos-
edly beryllium yttrium carbonate; no published
analysis.

THALENITE

$\text{Y}_4\text{Si}_4\text{O}_{13}(\text{OH})_2$

Related to yttrialite.

Th = 0.16%

Dana VI, appendix I, p. 68

THUCOLITE

A hydrocarbon.

See kolm and anthraxolite.

U = 4.9%, Th = 42.5%

These percentages are from the ash which
is only about 1 percent by weight of total
material.

Am. Mineralogist, vol. 13, pp. 419-448, 1928

TRITOMITE

A boro-silicate of the cerium and yttrium
metals, calcium, and thorium, also contain-
ing fluorine. Exact formula uncertain.

Th = 7.5 to 8.3%

Dana VI, p. 416

TSCHEFFKINITE

Complex silicate of rare earths, Fe,Mn,Mg,
Ca,Al,Ti,Th, and U.

Also chevkinite

U = 2.3%, Th = up to 18.4%

Am. Mineralogist, vol. 31, pp. 582-588, 1946

TURANITE

A hydrated copper vanadate reported to contain
3.2% U; validity of species is questionable.

Acad. sci. St. Petersburg, Bull. 3, p. 185,
1909

VANOXITE

A hydrated vanadium oxide, perhaps
 $2\text{V}_2\text{O}_4 \cdot \text{V}_2\text{O}_5 \cdot 8\text{H}_2\text{O}$, reported to contain
up to 0.5% U.

U. S. Geol. Survey Bull. 750, p. 63, 1924

VOLBORTHITE

$\text{Cu}_2(\text{VO}_4)(\text{OH})$

U = 3.1%

Nenadkevich and Volkov, Acad. sci. URSS,
C.R. 43, 1926

Calciovolborthite

$\text{Cu,Ca}(\text{VO}_4)\text{OH}$

Nenadkevich and Volkov, Acad. sci. URSS,
C. R. 43, 1926

WIIKITE

Ill-defined mixture and alteration product of
minerals high in Cb,Ta,Ti,Si, and Y.

Dana VII, p. 801

Nuolaite

A mixture similar to wiikite.

Th = 1.8 to 3.5%

Dana VII, p. 801

XENOTIME

YPO_4

U = up to 3.6%

Th = 0.4 to 2.9%

Dana VI, pp. 748-749

YTTRIALITE

Silicate of Th and Y metals chiefly.

U = 0.8%, Th = 10.5%

Dana VI, p. 512

YTTROCRASITE

$(\text{Y,Th,U,Ca})_2(\text{Ti})_4\text{O}_{11}?$

U = 2.3%, Th = 7.7%

Dana VII, p. 793

YTTROTANTALITE

$(\text{Fe,Y,U})(\text{Cb,Ta})\text{O}_4$

U = 3.4 to 3.9%

Th = 0.6 to 0.7%

Dana VI, pp. 763-764

Yttrocolumbite is similar

Am. Mineralogist, vol. 25, p. 155, 1940

ZIRCON

ZrSiO_4

U and Th very low in most samples, but up to 2.7% U, and up to 13.1% Th reported.

Dana VI, pp. 482-486

Alvite

Variety of zircon, near cyrtolite.

Th = 13.1%?

Dana VI, pp. 487-488

Calypsolite

Probably altered zircon.

Dana VI, pp. 482, 486

Cyrtolite

Altered zircon, containing U, Th, Y, and other rare earths.

U = up to 1.4%

Dana VI, p. 487

Hagatalite - synonym of zircon

U = tr., Th = 1.3%

Am. Mineralogist, vol. 11, p. 137, 1926

Hoegtveitite

May be alvite.

Am. Mineralogist, vol. 12, p. 97, 1927

Naegite - variety of zircon

U = 2.4 to 2.7%

Th = 2.5 to 4.4%

Chem. Soc. Japan Jour., vol. 42, p. 1, 1921

Also, Mineralog. Abs., vol. 2, p. 36, 1923

Oerstedite

Altered zircon.

Dana VI, p. 486

Oyamalite - variety of zircon

Th = 0.5%

Am. Mineralogist, vol. 11, pp. 137-138, 1926

Tachyaphalite

Probably altered zircon.

Dana VI, p. 486

Yamagutilite - variety of zircon

Also, yamaguchilite

Contains P_2O_5 and rare earths.

Mineralog. Mag., vol. 24, p. 626, 1937

ZIRKELITE

$(\text{Ca,Fe,Th,U})_2(\text{Ti,Zr})_2\text{O}_5?$

U = 1.4%, Th = 6.4%

Dana VII, p. 740

C. MINERALS THAT SHOULD BE TESTED FOR URANIUM AND THORIUM

ABUKUMALITE

CaY phosphate silicate

Am. Mineralogist, vol. 24, p. 66, 1939

AMBATOARINITE

Carbonate of Sr and rare earths.

Mineralog. Abs., vol. 1, p. 148, 1920

ANCYLITE

$Sr_3Ce_4(CO_3)_7(OH).3H_2O?$

Dana VI, appendix II, pp. 5-6

Weibyite

Related to ancyllite

Dana VI, pp. 291-292

BAZZITE

Silicate of scandium, with Fe, Na, and rare earths.

Mineralog. Abs., vol. 8, p. 105, 1941

BECKELITE

$Ca_3(Ce,La,Pr,Nd)_4Si_3O_{15}$

Dana VI, appendix II, p. 14

BRITHOLITE

A cerium-silicate apatite?

Dana VI, appendix II, pp. 19-20

BUSZITE

Silicate of rare earths

Am. Mineralogist, vol. 14, pp. 438-439, 1929

CENOSITE

$2CaO.(Ce,Y)_2O_3.CO_2.4SiO_2.H_2O?$

Also kainosite

Am. Mineralogist, vol. 15, pp. 205-219, 1930

CHURCHITE

A hydrous phosphate of cerium and calcium

Dana VI, p. 820

ERDMANNITE

Hydrous silicate of Ce, Y, Fe, Mn, Al, and Ca.

A mixture of homilite with a mineral in the melanocerite group?

Dana VI, pp. 416, 507

ERIKITE

Phosphate-silicate of rare earths, Al, Ca, and Na.

Mineralog. Mag., vol. 14, p. 348, 1907

EUDIALYTE

$X_5Y_2Si_6O_{18}(Oh,Cl)$

X = Ca, Na, Ce, etc.

Y = Zr, Fe, Cb, etc.

Dana VI, pp. 409-412

Eucolite

Same as eudialyte, but with different optical sign.

Dana VI, pp. 409-412

FLORENCITE

$CeAl_3(PO_4)_2(OH)_6$

Dana VI, appendix II, p. 42

FLUCERITE

$(Ce,La)F_3$

Am. Mineralogist, vol. 6, p. 119, 1921

Tysonite = fluocerite

Dana VI, p. 166

GADOLINITE

$Be_2FeY_4Si_2O_{13}$

Dana VI, pp. 509-512

HELLANDITE

$Ca_2(Ce,Al,Mn)_6Si_4O_{19}.3H_2O$

Mineralog. Mag., vol. 13, p. 368, 1903

LANTHANITE

$La_2(CO_3)_2.9H_2O$

Dana VI, pp. 302-303,

LESSINGITE

Silicate of the rare earths.

Mineralog. Abs., vol. 10, p. 245, 1948

LORANSKITE

$(Y,Ce,Ca)(Ta,Zr)O_4?$

Dana VII, p. 767

NUEVITE

Titano-columbate of Y, Fe, and Ta. Validity of species is questionable.

Am. Mineralogist, vol. 32, pp. 204-205, 1947

PARISITE

$CaCe_2F_2(CO_3)_3?$

Dana VI, pp. 290-291

Synchisite

$CaCeF(CO_3)_2$

Related to parisite.

Mineralog. Mag., vol. 13, pp. 207-208, 1902

PEROVSKITE GROUP**Perovskite**

$CaTiO_3$ - some analyses show rare earths.

Dana VII, pp. 730-734

Dysanalyte - synonym of perovskite; analysis shows rare earths.

Dana VII, pp. 730-732

Knopite - in perovskite group; analysis shows rare earths.

Dana VII, pp. 730-733

Loparite - end member in perovskite-knopite-loparite series.

Perhaps $(Na,Ce,Ca)_2(Ti,Cb)_2O_6$

Dana VII, pp. 730, 732-734

RETZIAN

Basic arsenate of Mn, Cu, and rare earths.

Dana VI, appendix I, p. 59

RHABDOPHANITE

Hydrous phosphate of Ce and Y groups; perhaps $(Ce,Y)PO_4 \cdot H_2O$

Also rhabdophane

Dana VI, p. 820

Scovillite - synonym of rhabdophanite

Dana VI, p. 820

SCHETELIGITE

$(Ca,Y,Sb,Mn)_2(Ti,Ta,Cb)_2(O,OH)_7$

Dana VII, p. 757

SPHENE

Essentially $CaTiSi_2O_5$, but commonly contains rare earths, columbium, and other elements.

Am. Mineralogist, vol. 32, pp. 637-642, 1947

Keilhauite = yttrian sphene

Dana VI, p. 717

Titanite - synonym of sphene

Yttrotitanite - synonym of keilhauite

THORTVEITITE

$(Sc,Y)_2Si_2O_7$

Am. Mineralogist, vol. 7, pp. 195-196, 1922

Befanamite - synonym of thortveitite

Am. Mineralogist, vol. 11, p. 137, 1926

TÖRNEBOHMITE

Chiefly $R_3(F,OH)(SiO_4)_2$

R = Ce, (La, ND), Al, Fe, Mn, Mg, Ca

Am. Mineralogist, vol. 6, pp. 118-119, 1921

WEINSCHENKITE

$YPO_4 \cdot 2H_2O$

Am. Mineralogist, vol. 29, pp. 97-107, 1944

D. MINERALS THAT ARE NON-URANIUM- OR NON-THORIUM-BEARING,
BUT THAT HAVE BEEN REPORTED TO CONTAIN IMPURITIES OR
INTERGROWTHS OF URANIUM, THORIUM, OR RARE-EARTH MINERALS

BADDELEYITE



Analyses show traces of rare earths.

Dana VII, pp. 607-610

Brazilite - mixture of fibrous baddeleyite,
zircon, altered zircon, and other minerals

Dana VII, p. 610

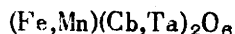
Caldasite - mixture of baddeleyite, zircon,
altered zircon, and other minerals.

Dana VII, p. 610

Zirkite - mixture of baddeleyite, zircon,
altered zircon and other minerals.

COLUMBITE-TANTALITE SERIES

Columbite



U = up to 1.7%

Dana VII, pp. 780-785

Baierite - synonym of columbite

Also baierine

Dana VII, p. 780

Dianite - synonym of columbite

Dana VII, p. 780

Ferrocolumbite - synonym of columbite

Dana VII, pp. 780, 783

Ferro-ilmenite - synonym of columbite

Dana VII, pp. 780, 785

Ferroantalite - synonym of tantalite

Dana VII, pp. 780, 783

Greenlandite - synonym of columbite

Dana VII, pp. 780, 784

Hermannolite - synonym of columbite

Dana VII, pp. 780, 785

Ildefonsite - synonym of tantalite

Dana VII, p. 780

Manganocolumbite - variety of columbite

Dana VII, pp. 780, 783-784

Manganotantalite - synonym of tantalite
Dana VII, pp. 780, 783-784

Siderotantalite - synonym of tantalite
Dana VII, p. 780

Tantalite
 $(Fe, Mn)(Ta, Cb)_2O_6$

FLUORITE



Some samples, especially those of deep-purple color show radioactivity. This generally can be shown to be due to inclusions of uranium minerals, but the fluorite itself may possibly contain traces of uranium.

Dana VI, pp. 161-164

Yttrocerite

CaF_2 with varying amounts of $(Y, Ce)F_3$.

Dana VI, p. 182

Yttrofluorite - yttrian variety of fluorite

Mineralog. Mag., vol. 16, p. 376, 1913

FRANCOLITE

An apatite which is an important constituent of many phosphate rocks, but which analyses show contains very little rare earths.

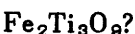
Dana VI, pp. 762, 764

ILMENORUTILE

Columbian rutile.

Dana VII, pp. 554, 557, 560

KALKOWSKITE



Analysis shows rare earths.

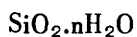
Dana VII, pp. 773-774

KATANGITE



Is identical with chrysocolla; found together with uranium minerals in Katanga, Belgian Congo.

Am. Mineralogist, vol. 8, p. 39, 1923

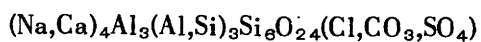
OPAL

Some varieties show green fluorescence due to uranium content.

PYROMORPHITE

Some specimens are uraniferous.

Zeitschr. Kristallographie, vol. 62, pp. 177-178, 1925

SCAPOLITE

A fluorescent variety contains 0.023% U.

Chemie der Erde, vol. 9, pp. 139-144, 1934-35

SEFSTRÖMITE

Mixture largely of ilmenite, similar to davidite.

Dana VII, p. 542

STRUEVERITE

Tantalian rutile.

Dana VII, pp. 554, 557-560

TAPIOLITE SERIES

Cassiterotantalite - synonym of ixiolite

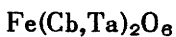
Dana VII, p. 778

Ixiolite - may be equal to tapiolite

Dana VII, p. 778

Ixionolite - synonym of ixiolite

Mossite

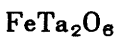


Dana VII, pp. 775-777

Skogbölite - synonym of tapiolite

Dana VII, pp. 775-778

Tapiolite



Dana VII, pp. 775-777

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- (A) indicates minerals containing uranium or thorium as major constituents.
 (B) indicates minerals containing minor amounts of uranium or thorium.
 (C) indicates minerals that should be tested for uranium and thorium content.
 (D) indicates minerals that are non-uranium- or non-thorium-bearing, but that have been reported to contain impurities or intergrowths of uranium, thorium, or rare-earth minerals.

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