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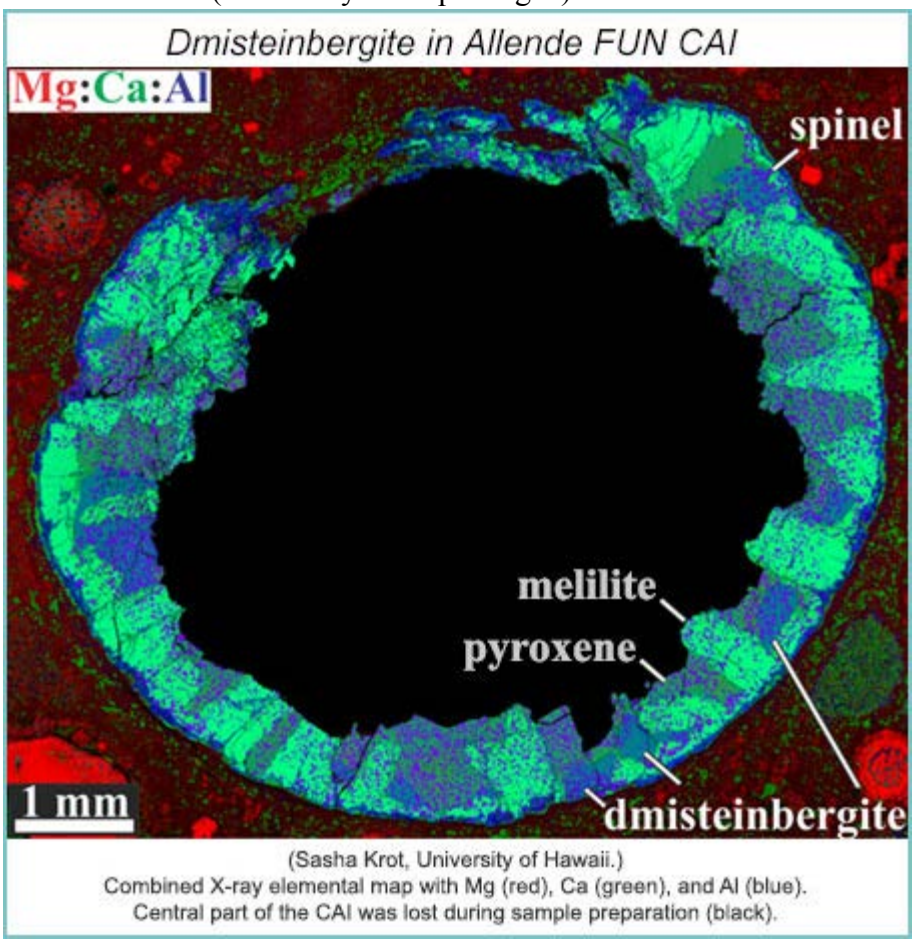
Quick Views of Big Advances

Dmisteinbergite: Refractory Mineral in Allende FUN CAI

The occurrence in a meteorite of dmisteinbergite, an hexagonal form of $CaAl_2Si_2O_8$, was reported in the July 2013 issue of ***American Mineralogist*** by the team of Chi Ma (Caltech), Alexander Krot (University of Hawai'i), and Martin Bizzarro (University of Copenhagen).



(Sasha Krot, University of Hawaii.)
Combined X-ray elemental map with Mg (red), Ca (green), and Al (blue).
Central part of the CAI was lost during sample preparation (black).

Found in a coarse-grained, rare type of calcium-aluminum-rich inclusion (***CAI***) known as a ***FUN CAI*** from the Allende carbonaceous chondrite [***Data link*** from the Meteoritical Bulletin], dmisteinbergite is one of 10 refractory silicates identified in CAIs to date. Among the oldest solids in our Solar System, researchers are studying these materials to tease out the details of the conditions and processes of the early ***solar nebula***. Previous experiments by others have shown that dmisteinbergite crystallizes before ***anorthite*** when melts were supercooled below metastable ***liquidus***, hence researchers suggest the course-grained igneous dmisteinbergite in the Allende FUN CAI likely crystallized from a silicate melt at high temperature (~1200–1400 °C) by rapid cooling.

Ongoing work on this Allende FUN CAI will be reported at the 76th annual Meteoritical Society Meeting in July/August, 2013 showing evidence of a second generation of fine-grained, needle-like crystals of dmisteinbergite occuring in an alteration zone. Researchers suggest the fine-grained dmisteinbergite formed subsequently by hydrothermal alteration on the asteroidal parent body. A hydorthermal origin has also been invoked for dmisteinbergite identified in a CAI from NWA 2086, another carbonaceous chondrite [***Data link*** from the Meteoritical Bulletin].

(pdf version)

See References Below:

· Fintor, K., Park, C., Krot, A. N., Nagy, Sz., and Pál-Volnár E. (2013) Hydrothermal Origin of Hexagonal $CaAl_2Si_2O_8$ (Dmisteinbergite) in a Type A CAI from the NWA 2086 CV3 Chondrite, *76th Annual Meteoritical Soceity Meeting* [***abstract 5063*** pdf].

· Ma, C., Krot, A. N., and Bizzarro, M. (2013) Discovery of Dmisteinbergite (hexagonal $CaAl_2Si_2O_8$) in the Allende Meteorite: A New Member of Refractory Silicates Formed in the Solar Nebula, *American Mineralogist,* v. 98, p. 1368-1371, doi: 10.2138/am.2013.4496. [***abstract***]

· Park, C., Nagashima, K., Ma, C., Krot, A. N., and Bizzarro, M. (2013) Two Generations of Hexagonal $CaAl_2Si_2O_8$ (Dmisteinbergite) in the Type B2 FUN CAI STP-1, *76th Annual Meteoritical Soceity Meeting* [***abstract 5048*** pdf].

See also:
· Holst, J. C., Olsen, M. B., Paton, C., Nagashima, K., Schiller, M., Wielandt, D., Larsen, K. K., Connelly, J. N., Jørgensen, J. K., Krot, A. N., Nordlund, Å., and Bizzarro, M. (2013) ^{182}Hf-^{182}W Age Dating of a ^{26}Al-poor Inclusion and Implications for the Origin of Short-lived Radioisotopes in the Early Solar System, *Proceedings of the National Academy of Science,* v. 110(22), p. 8819-8823, doi: 10.1073/pnas.1300383110. [***abstract***]

· 2013 Meteoritical Society Meeting ***homepage***.

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