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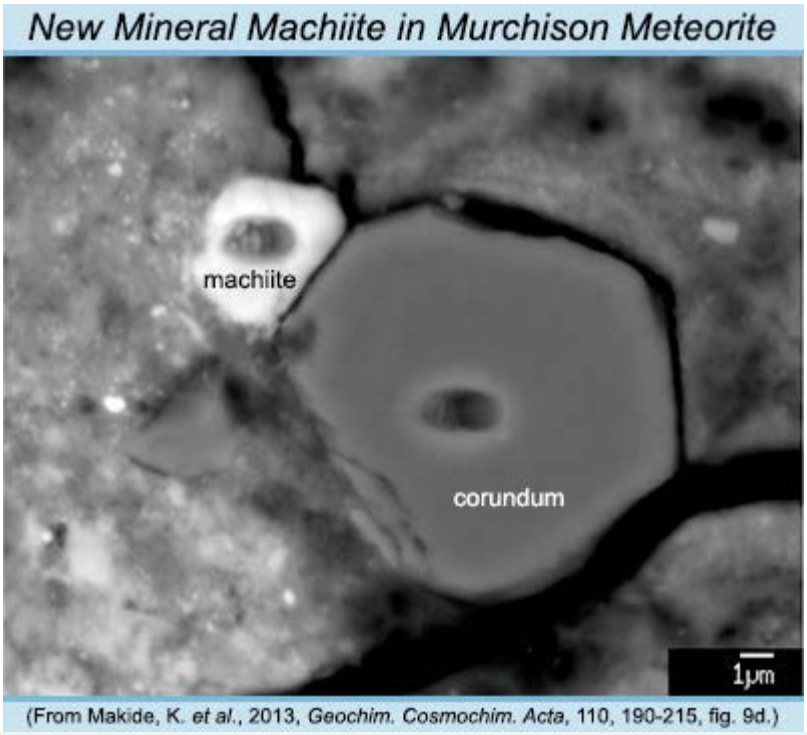
New Mineral: Machiite

A new ultra-***refractory*** mineral discovered in the Murchison meteorite [Data link from the ***Meteoritical Database***] has been named after Dr. Chi Ma, the Director of the Geological and Planetary Sciences Division–Analytical Facility at Caltech. He is distinguished for his nano-scale mineralogical expertise and discoveries of many new minerals.



Backscattered electron image of a portion of the Murchison meteorite showing new mineral, machiite, intergrown with corundum. The oval spot in each crystal is a region sputtered during oxygen-isotope measurement. Image courtesy of Alexander Krot, University of Hawai'i. (From Makide, K. *et al.,* 2013, *Geochim. Cosmochim. Acta,* v. 110, p. 190-215, figure 9d.)

The mineral and name, machiite, were approved in October, 2016 by the *International Mineralogical Association's Commission on New Minerals, Nomenclature, and Classification*.

Machiite, $Al_2Ti_3O_9$, was discovered by cosmochemist Alexander N. Krot (University of Hawai'i). The mineral has a general formula of $(Al,Sc)_2(Ti,Zr)_3O_9$ and is the aluminum analogue of the vanadium, titanium oxide mineral schreyerite. Machiite was found intergrown with corundum in the matrix of Murchison and was discovered to be ***^{16}O***-poor compared to corundum ($\Delta^{17}O$ values of 0‰ and -24‰, respectively).

Similar to refractory solids previously identified in meteorites, machiite could have either condensed from ***solar nebula*** gas or crystallized from a refractory melt before the planets formed, about 4.6 billion years ago. Oxygen isotope disequilibrium between machiite and corundum may indicate post-crystallization oxygen-isotope exchange in the ***protoplanetary disk***. Studies of these early solids are invaluable for understanding the details of nebular evolution and the formation of asteroids and planets.

See References:

· Krot, A. N. (2016) Machiite, IMA 2016-067. CNMNC Newsletter No. 34, December 2016, page 1317; *Mineralogical Magazine,* v. 80, p. 1315-1321, doi: 10.1180/minmag.2016.080.086. [***link***, may require login]

· Makide, K., Nagashima, K., Krot, A. N., Huss, G. R., Hutcheon, I. D., Hellebrand, E., and Petaev, M. I. (2013) Heterogeneous Distribution of ^{26}Al at the Birth of the Solar System: Evidence from Corundum-bearing Refractory Inclusions in Carbonaceous Chondrites, *Geochimica et Cosmochimica Acta,* v. 110, p. 190-215, doi: 10.1016/j.gca.2013.01.028. [***abstract***]

See also:
· Dr. Chi Ma's ***new mineral announcements***.

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