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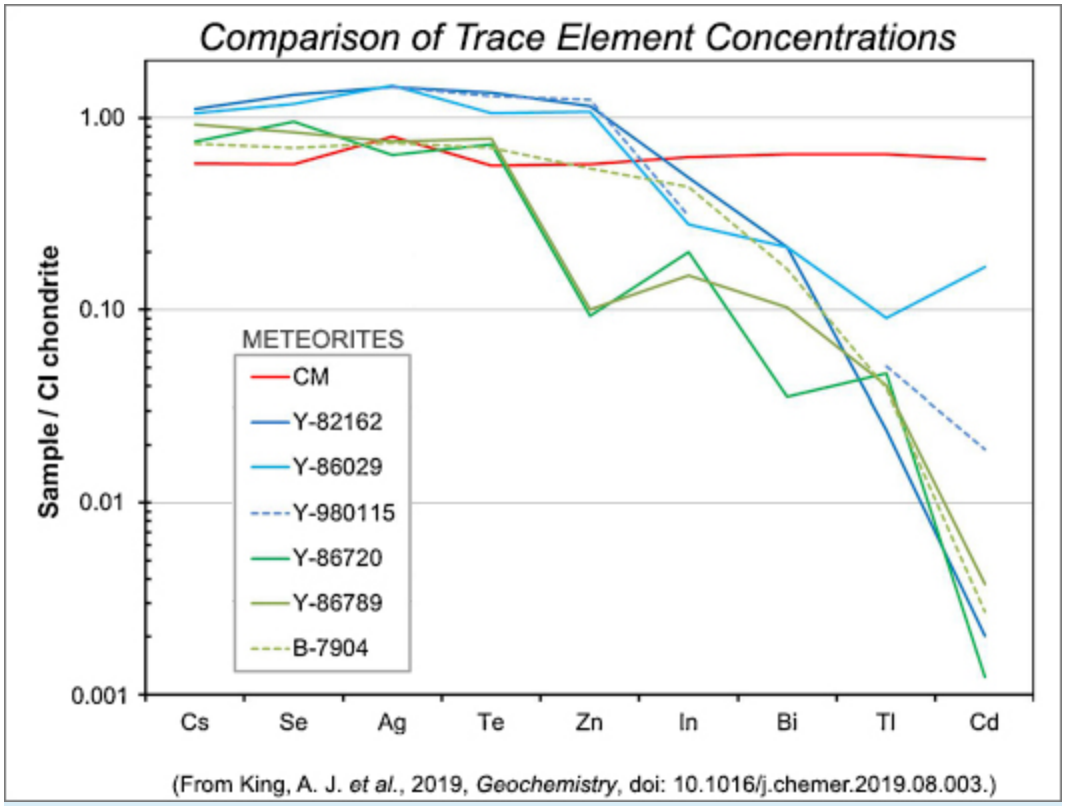
Building the Case for a New CY Group of Carbonaceous Chondrites

Researchers support naming a new CY group of ***carbonaceous chondrite*** meteorites that may be similar to near-Earth asteroid Ryugu, the target of sample return in December 2020.

Ashley J. King (Planetary Materials Group, Natural History Museum, London) and colleagues analyzed six carbonaceous chondrites that share mineralogical, textural, and chemical similarities that are enough, they say, to warrant designation as a distinct, new chemical group, the CYs ("Yamato-type"). This was a conclusion also expressed in 1992 by Yukio Ikeda (Ibaraki University, Japan) who reported results from a consortium research effort on the inaugural three samples of the group, which were shown to have distinct oxygen isotopic compositions but some mineralogical and chemical similarities to CI and CM groups.

The meteorites were collected in Antarctica by the National Institute of Polar Research of Japan. Listed in the official ***Meteoritical Database*** currently as either CI or ungrouped hydrated (of petrologic type 1 or 2), these meteorites are among the most aqueously altered types. Data links from the Meteoritical Database:
Yamato 82162, ***Yamato 86029***, ***Yamato 980115***, ***Yamato 86720***, ***Yamato 86789***, and ***Belgica 7904***.



One of the shared characteristics of this group of meteorites is the depletion of ***volatile*** elements relative to the concentrations in CI chondrites. This plot shows trace element concentrations in the six meteorites designated as the CY group (blue and green lines) compared to the average abundances for CM chondrites (red line) relative to CI chondrites.

The carbonaceous chondrite meteorites in this study record a period of intense aqueous alteration that was followed by at least one thermal metamorphic event at temperatures greater than 500 degrees Celsius. Moreover, King and coauthors say the short ***cosmic-ray exposure ages*** (≤ 1.3 million years) suggest these meteorites are from a near-Earth source. They point to a relationship of CY chondrites to C-type asteroids and suggest CY chondrites are good analogues for asteroid 162173 Ryugu. This idea will soon be tested! The Japan Aerospace Exploration Agency's Hayabusa2 spacecraft has finished sampling Ryugu and is en route to Earth, scheduled to release its re-entry capsule holding its collection of asteroid ***regolith*** to us in December 2020.

See Reference:

· King, A. J., Bates, H. C., Krietsch, D., Busemann, H., Clay, P. L., Schofield, P. F., and Russell, S. S. (2019) The Yamato-type (CY) Carbonaceous Chondrite Group: Analogues for the Surface of Asteroid Ryugu? *Geochemistry,* doi: 10.1016/j.chemer.2019.08.003. [***abstract***]

See also:

· Ikeda, Y. (1992) An Overview of the Research Consortium, "Antarctic Carbonaceous Chondrites with CI Affinities, Yamato-86720, Yamato-82162, and Belgica-7904," *Procedings NIPR Symp. Antarctic Meteorites,* v. 5, p. 49-73.

· Jaumann, R. and 49 others (2019) Images from the Surface of Asteroid Ryugu Show Rocks Similar to Carbonaceous Chondrite Meteorites, *Science,* v. 365(6455), p. 817-820, doi: 10.1126/science.aaw8627. [***abstract***]

· Kitazato, K. and 65 others (2019) The Surface composition of Asteroid 162173 Ryugu from Hayabusa2 Near-infrared Spectroscopy, *Science,* v. 364(6437), p. 272-275, doi: 10.1126/science.aav7432. [***abstract***]

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