PLANETARY SCIENCE RESEARCH DISCOVERIES
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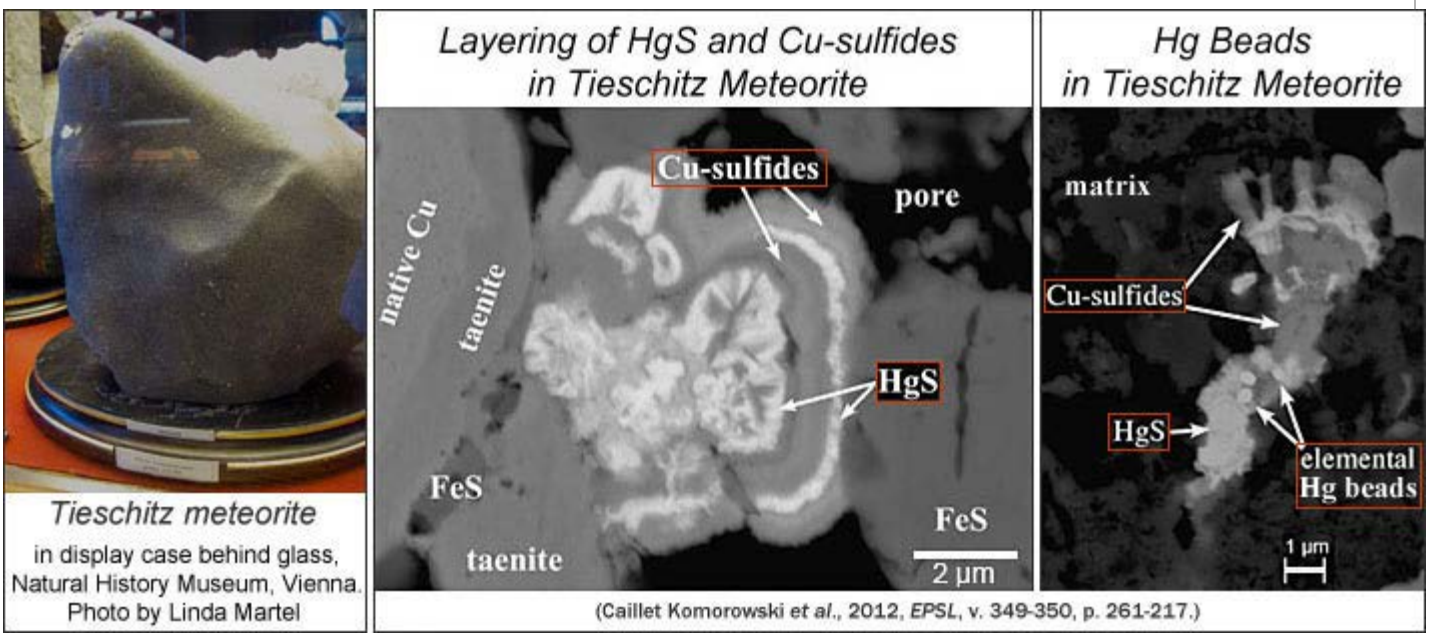
Quick Views of Big Advances

Discovery of Native Mercury and Mercury Sulfide in Tieschitz Meteorite

An international research team has reported the discovery of micrometer-sized assemblages of ***native*** mercury (Hg) beads, mercury sulfide (HgS, cinnabar) and copper (Cu) sulfide associated with native Cu in the fine-grained matrix of the Tieschitz meteorite [***Data link*** from the Meteoritical Bulletin]. Tieschitz was observed to fall in the Czech Republic in 1878 (see lefthand photo of the 28-kilogram stone). It is an unshocked H/L-3.6 ***chondrite***; the H stands for high-iron chemical group, L is low iron, signifying that its iron content is intermediate between H and L groups. The numeric refers to petrologic type 3, characterized by abundant chondrules embedded in matrix material, unequilibrated mineral assemblages, and low degrees of aqueous alteration.



[Left] The main mass of the 28-kilogram Tieschitz meteorite is on display in a glass-covered case at the Natural History Museum, Vienna, Austria. [Center] Field emission secondary electron microscopy–back-scattered electron (FESEM BSE) image of alternating layers of intergrowths of HgS and Cu-sulfide. [Right] FESEM BSE image showing nanometer-sized beads of native Hg in the Hg- and Cu-sulfides.

This is the first detection of Hg-Cu-bearing metal-sulfide assemblages in a ***primitive*** chondrite, though a high Hg-bulk content of 7200 nanogram/gram was reported previously for Tieschitz, and sulfide had been predicted as a host phase for Hg.

Catherine Caillet Komorowski (Muséum National d'Histoire Naturelle, Paris) and colleagues found HgS and Cu-sulfide in alternating layers (see center image). Even more intriguing, the researchers found the first natural occurrence of native Hg in a meteorite (see righthand image). Nanometer-sized spherules of native Hg were found within the HgS and copper sulfides and in spongy-texture metallic copper. The authors noted that the native Hg beads evaporated after short electron beam bombardment in the scanning electron microscope, so they used low vacuum (25 Pa) and a cooled stage to preserve the beads and prevent damage to the sulfide layers. The native Hg, and the Hg- and Cu-sulfides occur within or near opaque aggregates of angular grains of native Cu, troilite (FeS), and kamacite and taenite (two FeNi alloys

with different Ni concentrations). These aggregates are distributed heterogeneously in the matrix.

They suggest their findings indicate: ***condensation*** of the opaque metal aggregates and formation of sulfides in a gas reservoir of non-solar composition in the ***nebula*** (which could explain the simultaneous nucleation and growth of the Hg- and Cu-sulfides), followed by fast ***accretion*** at low temperatures (<300°C based on sulfide phase relations), with no thermal processing or aqueous alteration after accretion (so as to preserve the angular-grained aggregates of native Cu and sulfides, the newly discovered native Hg, and finely-layered Hg- and Cu-sulfides).

See: Catherine Caillet Komorowski, Ahmed El Goresy, Masaaki Miyahara, Omar Boudouma, Chi Ma (2012) Discovery of Hg-Cu-bearing Metal-sulfide Assemblages in a Primitive H-3 Chondrite: Towards a New Insight in Early Solar System Processes, *Earth and Planetary Science Letters,* v. 349-350, p. 261-271, doi: 10.1016/j.epsl.2012.06.039. [***paper***].

Written by Linda Martel, Hawai'i Institute of Geophysics and Planetology, for ***PSRD***.