

The first new mineral with post-spinel structure is approved by CNMNC of IMA

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Xiete is the first new mineral with post-spinel structure found by a Chinese-American team from the Guangzhou Institute of Geochemistry, Chinese Academy of Sciences and the Geophysical Laboratory, Carnegie Institution of Washington, which has recently been approved by the Commission on New Minerals, Nomenclature and Classification of the International Mineralogical Association. The data of this new mineral are reported in Issue 21 (November, 2008) of *Chinese Science Bulletin*.

Spinel structure is one of the most important types of structures of minerals in Earth's mantle. This study presents the first natural occurrence of post-spinel mineral "xieite", which occurs in the Suizhou meteorite which underwent a strong collision in space. The mineral is a high pressure polymorph of chromite-spinel with a density about 10% denser than chromite. The pressure and temperature condition for the formation of xieite is 18—23 GPa, equal to a pressure from a depth more than 500 km from the surface of the Earth, and 1800--1950C.

Forty years ago, in search for denser polymorphs of the then experimentally discovered silicate spinel (ringwoodite) and modified spinel (wadsleyite) that are stable at the pressure and temperature conditions of the Earth's transition zone, scientists started to search for a post-spinel phase denser than spinel which may appear at much higher pressure.

Ringwood A. E., a famous Australian geoscientist, first proposed

orthorhombic CaTi_2O_4 -type structures as the top candidate for "post-spinel" transition in the Earth's mantle. Although ferromagnesian silicate spinels (such as ringwoodite) were later found to break down to simple oxides or stishovite plus perovskite, several post-spinel oxides experimentally convert into a single phase with the CaFe_2O_4 -type and CaTi_2O_4 -type structures. Neither dense post-spinel polymorphs nor silicate perovskites, however, have been discovered in nature and confirmed as new mineral.

It remains a stigma for decades if there is a real post-spinel phase in the Earth's mantle because no such crystal structure was ever identified in natural occurrence. Ming Chen and coworkers first made a breakthrough in this aspect and discovered a natural post-spinel mineral.

The finding of new mineral xieite in meteorite demonstrates its potential occurrence in the Earth. If xieite was found in the rocks on the Earth's surface, these rocks would be exhumed from the Earth's mantle at a depth of more than 500 km. Because chromite is a common accessory mineral occurring in meteorites and Earth's mantle rocks, xieite could be another potential pressure gauge not only for collisions between asteroids, but also for the rocks exhumed from the deep Earth.

Source: Science in China Press

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