HYDROTHERMAL EXPERIMENTS OF SYNTHETIC AMORPHOUS SILICATES WITH CI CHONDRITIC COMPOSITION IN THE SYSTEMS WITH AND WITHOUT FeO.

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Introduction: In order to investigate the aqueous alteration process in carbonaceous chondrites, many hydrothermal experiments have been performed using mineral grains, such as olivine and enstatite, or chondrites themselves as the starting materials. (e.g., [1]). In contrast, interstellar silicates, which are considered to be the most primitive material in the solar nebula, are amorphous based on infrared astronomical observations [2]. In addition, unique carbonaceous chondrites, such as Acfer 094, contain primitive amorphous silicates in the matrix [3]. Therefore, it is important to investigate the aqueous alteration of amorphous silicates. In this study, in order to understand the aqueous alteration process and its conditions on the chondrite parent bodies, we have carried out hydrothermal alteration experiments of synthetic amorphous silicates with the CI chondritic composition.

Experimental: Two types of starting materials were synthesized by sol-gel method. The first is FeO-free amorphous silicate with the CI chondritic composition (Na_2O-MgO-Al_2O_3-SiO_2-CaO-NiO). This amorphous silicate was heated at 750°C for 20 hours for preparing a mixture of amorphous and crystalline silicates (forsterite), which was also used as starting materials. A mixture of the starting material and pure water was put in an inner reaction vessel of Teflon with an outer stainless steel jacket (SUS-316). The vessel was heated in an electric furnace at 100-200°C for 24-336 hours. Run products were analyzed using X-ray diffraction, field-emission scanning electron microscopy equipped with energy-dispersive X-ray spectroscopy and infrared spectroscopy. Some results have been already reported in [4]. Saponite was formed first from amorphous silicates, then serpentine was formed by consuming saponite and forsterite. Calcite was formed at 200°C. A mineral assemblage of serpentine, calcite and a minor amount of forsterite at 200°C for 504 hours resembles that of CM chondrites.

The other starting material is FeO-bearing amorphous silicate with the CI chondritic composition (Na_2O-MgO-Al_2O_3-SiO_2-CaO-FeO-NiO; a part of Fe was excluded as FeS). In this type of experiments, we used a double-tube of Ag-Pd alloy (inner tube) and Au (outer tube) as a reaction vessel. A mixture of starting material (amorphous silicates, amorphous silicates with metallic iron or amorphous silicates with iron sulfide) was put in the outer tube with pure water or 1N ammonia water. Wüstite and magnetite powders were put in the inner tube to buffer the oxygen partial pressure in the vessel. The charge was heated in an electric furnace at 300°C for 5 and 30 days. Serpentine, magnetite and calcite were formed in this FeO-bearing system. This mineral assemblage is also similar to that of CM chondrites as in the case of Fe-free system.

References: [1] Ohnishi I. & Tomeoka K. 2006. *Meteoritics & Planetary Science* 42:49–61. [2] Kemper F. et al. 2004. *Astrophysical Journal* 609:826-837. [3] Greshake A. 1997. *Geochimica et Cosmochimica Acta* 61:437-452. [4] Noguchi R. et al. 2007. The Japanese Society for Planetary Science, Fall meeting, 76.