

## Experimental aqueous alteration of the Allende meteorite with carboxylic acid solution under low oxygen fugacity

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Carbonaceous chondrites are the most primitive materials which keep information of processes in the early solar system. Especially, hydrous phyllosilicate minerals in CM chondrites are the first products of aqueous alteration in the early solar system.

CM chondrites contain organic acids (Cronin, 1988). Aqueous alteration fluid on the CM chondrite parent body may contain organic acid. We reported experimental study of aqueous alteration of Allende meteorite with acetic acid solution. Jones and Brearley (2006) carried out aqueous alteration experiments of Allende meteorite under oxidizing condition. The redox condition of the early solar nebula, however, should be extremely reducing condition because its major component is hydrogen.

In this study, we carried out aqueous alteration experiments of Allende meteorite with acetic acid solution under low oxygen fugacity. We used double capsule method to control  $fO_2$ . Metallic iron powder and distilled water are sealed in a gold capsule with an Ag-Pd inner capsule sealed with starting material and solution. Oxygen fugacity in both capsules should be kept on Fe-FeO buffer condition. Starting material is powdered Allende meteorite. Solutions are distilled water and 0.1N acetic acid. The experiments were carried out at temperatures of 200, 250 and 300 degree C, for durations of 1, 2 and 4 weeks.

Run products are observed with X-ray diffractometer (XRD), scanning electron microscope (SEM) and energy dispersive X-ray spectroscopy (EDS). XRD shows that all run products contain serpentine. SEM observations show that the serpentine is alteration product of olivine. Matrix derived Fe-rich olivine altered to serpentine in the experiment of the lowest temperature and the shortest run duration. Mg-rich olivine derived from chondrules altered to serpentine in longer duration run products.

Oxygen fugacity condition in aqueous alteration processes and compositions of olivine and serpentine as precursor and product materials will be discussed with occurrence of hydrous phyllosilicate minerals in CM chondrites.