COMPOSITIONAL VARIATION OF PHYLLOSILICATE MINERALS IN AQUEOUS ALTERATION EXPERIMENT OF ALLENDE METEORITE UNDER REDUCED CONDITION. H. Isobe[1] and H. Ozaki[1], [1]Dept. Earth Sci., Grad. School Sci. Tech., Kumamoto Univ., Kurokami, Kumamoto, 860-8555, JAPAN, isobe@sci.kumamoto-u.ac.jp.

Introduction: 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 on the meteorite parent body in the early solar system.

CM chondrites also contain organic acids [1]. Aqueous alteration fluid on the CM chondrite parent body may contain organic acid. Jones and Brearley (2006) carried out aqueous alteration experiments of Allende meteorite under oxidizing condition [2]. The redox condition surrounding the meteorite parent body before blow out of the 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.

Experimental: We used double capsule method to control fO_2 in the hydrous alteration experiments. Metallic iron powder and distilled water are sealed in a gold capsule with an Ag-Pd inner capsule sealed with 10mg of powdered Allende meteorite as 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 or 0.1N acetic acid. The experiments were carried out at temperatures of 200, 250 or 300 °C, for durations of 1, 2 or 4 weeks. Capsules are sealed in Morey type hydrothermal synthesis bomb with distilled water. Run pressure is water vapor pressure at each temperature. Run products are observed with X-ray diffractmeter (XRD), scanning electron microscope (SEM) and energy dispersive X-ray spectroscopy (EDS).

Results and Discussion: XRD pattern shows that primary aqueous alteration product is serpentine. SEM observations show that the serpentine occurs around olivine crystals. Allende meteorite matrix derived Fe-rich olivine altered to serpentine in the experiment of the lowest temperature and the shortest run durations. Serpentine produced from matrix olivine has Fe-rich composition. In the run products with higher temperature, Mg/Fe composition of serpentine shows broader distribution to Mg-rich composition than that of 200 °C experiments. Mg-rich olivine derived form chondrules contribute to produce serpentine in higher temperature. Mg/Fe composition range of serpentine is getting narrower with run duration (Fig. 1).

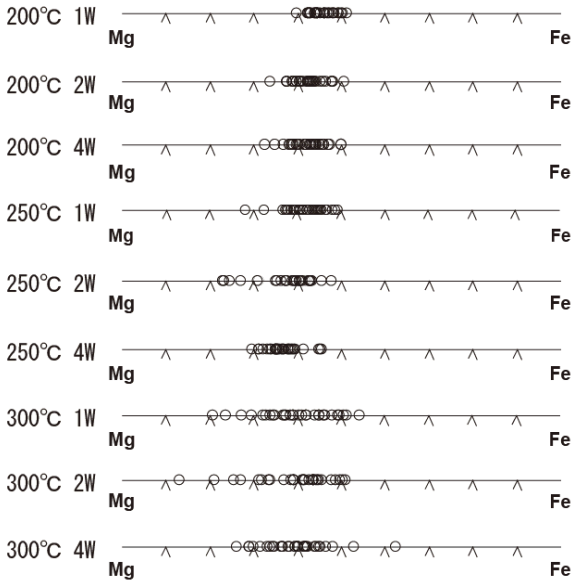

Fig. 1 Distribution of Mg/(Mg+Fe) compositions of serpentines in the run products.

The results of this study suggest that alteration temperature and duration control compositional distribution range of phyllosilicate from heterogeneous olivine. Higher alteration temperature produces wider compositional range. Then, alteration period brings homogenization of serpentine. Phyllosilicate minerals as aqueous alteration products in CM chondrites have various Mg/Fe compositions. Compositional range of phyllosilicates in aqueous alteration products may have information of alteration conditions on temperature and durations.

References:

[1] Cronin J. R., Pizzarello S. and Cruikshank D. P. (1988) *in Meteorites and the early solar system* 819–857. [2] Jones C. L. and Brearley A. J. (2006) *Geochim. Cosmochim. Acta., 70,* 1040-1058.