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CI-like phyllosilicate-rich microclasts in the Yamato81020 (CO3.0) chondrite

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Yamato81020 (Y-81020) chondrite is classified as petrologic type CO3.0 and has been recognized as one of the most primitive CO chondrites, obviously unaltered by secondary parent body processes such as aqueous thermal metamorphism or aqueous alteration [1]. In addition, it has been reported that the meteorite shows no evidence of brecciation and no obvious shock effects [1-2]. Our thorough microscopic study of Y-81020, however, brought out the clear evidence of aqueous alteration from small clasts embedded in matrix. Here, we report detailed mineralogical and petrographic characteristics of aqueous altered texture in Y-81020 to unravel the early aqueous alteration history of the parent body.

A thin section of Y-81020 was studied using a scanning electron microscope (SEM), a transmission electron microscope (TEM), equipped with an energy dispersive X-ray spectrometer (EDS), and synchrotron radiation X-ray diffraction (SR-XRD) technique to identified crystal phase. Micro-sized sample were prepared with the focused ion beam (FIB) technique.

The studied Y-81020 contain well defined chondrules (52 vol.%) and CAI/AOA (3 vol.%) set in a fine-grained matrix (45 vol.%). In the matrix, we found a total of 20 clasts (30-300 micro-meters in size), those mineralogy is distinctly different from matrices. As SR-XRD analyses, the clasts consists mainly olivine and magnetite, with small (but significant) amount of smectite and serpentine. High resolution TEM observations indicated that the phyllosilicates show the periodicity of 1.1-1.3 nm, corresponding to (001) plane of smectite. The clasts often contain framboidal or platelet magnetite, which are typical morphology in CI chondrite. These results consistently suggest that the clasts had been altered by intensive aqueous alteration under a condition similar to CI chondrites. Moreover we found that matrix contain minor amount of serpentine. The presence of hydrated minerals in clasts and matrix suggests that the CO parent body was experienced various degree of aqueous alteration, and a brecciation process has subsequently occurred in the parent body.

[1]Rubin and Wasson (2005) *GCA* ***69****, 211.* [2]Scott et al. (1992) *GCA,* ***56****, 4281.*

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