Japan Geoscience Union Meeting 2014
(28 April - 02 May 2014 at Pacifico YOKOHAMA, Kanagawa, Japan)

PPS25-07 Room:213 Time:May 2 10:30-10:45

O-16-rich olivine in igneous rim from NWA 3118 (CV)

MATSUDA, Nozomi[1*] ; SAKAMOTO, Naoya[2] ; YURIMOTO, Hisayoshi[3]

[1]Natural History Sciences, Hokkaido University, [2]CRIS, Hokkaido University, [3]Natural History Sciences, Hokkaido University

Ca-Al-rich inclusions (CAIs) and chondrules in chondrites show mass independent oxygen isotopic fractionation. Normally, CAIs are enriched in O-16 whereas chondrules are depleted in O-16. However, olivine grains having O-16-rich composition were reported in chondrule rims from CR2 chondrites (Takeda et al., 2002; Nagashima et al., 2013). Existence of O-16-rich grains in the rims indicates that the chondrule rims preserve information about chondrule precursor components with oxygen isotope in the chondrule formation region. In addition, abundance and distribution of O-16-rich olivine in chondrule rims have not been studied for other chondrite groups. Therefore, we study petrology and oxygen isotopic mapping of an igneous chondrule rim from a CV3 chondrite in order to reveal the distribution of O-16-rich materials.

The sample used in this study is a polished thin section from NWA 3118 CV3 chondrite. The petrographic observation and chemical analysis were performed by FE-SEM-EDS (JEOL JSM-7000F + Oxford X-Max 150). Crystal orientation analysis was studied by EBSD (Oxford HKL). Isotope mapping technique for oxygen was applied by an isotope microscope (Cameca ims-1270 + SCAPS).

The chondrule studied here has 1.4 millimeters in diameter and Mg-rich (type I) porphyritic texture mainly composed of forsterite, low-Ca pyroxene and feldspathic mesostasis. The chondrule is surrounded by rim that shows an evidence of igneous process with the thickness of up to 400 micrometers. The rim is mostly composed of ferromagnesian olivine and also contains low-Ca pyroxene, high-Ca pyroxene, Fe-Ni metal and sulfide. The Fe-rich olivine grains often show Fe-Mg zoning, suggesting that diffusional Fe-Mg exchange has occurred during metamorphism on the parent body.

In this study, seven O-16-rich olivine grains with 10-30 micrometers in diameter were found in the igneous rim. O-16-enrichments are observed in core of the olivine crystals. The oxygen isotope heterogeneity and the chemical composition are not correlated. This result suggests that these O-16-rich parts are relict and overgrown by O-16-poor olivine crystallized from melt during rim formation.

The existence of O-16-rich olivine in the rim from CV chondrite indicates that both O-16-rich and O-16-poor materials exist in the chondrule formation region.

Keywords: chondrule rim, chondrule, oxygen isotopes, carbonaceous chondrite, SIMS