

Extreme ^{16}O -rich CAIs in Isheyevov chondrite

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Introduction: Oxygen isotopic composition of the Solar System is believed to be formed by mixing of ^{16}O -rich and ^{16}O -poor reservoirs. The ^{16}O -poor end member ($\Delta^{17}\text{O} = +85\text{‰}$) reported from cosmic symplectites composed of magnetite and iron sulfide infers that the ^{16}O -poor reservoir is H_2O [1]. On the other hand, several candidates are reported for ^{16}O -enriched reservoir from a chondrule named a006 ($\Delta^{17}\text{O} = -37\text{‰}$) [2], 4 CAIs ($\Delta^{17}\text{O} = -37 \sim -32\text{‰}$) [3,4] and the Sun ($\Delta^{17}\text{O} = -28\text{‰}$) [5] relative to other CAIs ($\Delta^{17}\text{O} = -23\text{‰}$) [e.g. 6]. In this study, we surveyed ^{16}O -rich CAIs in Isheyevov chondrites to investigate the ^{16}O -rich end member.

Experimental: Thirteen thick sections of Isheyevov chondrite were newly prepared. X-ray elemental maps were obtained for whole sections by FE-SEM-EDS. Oxygen isotope analysis were performed by SIMS.

Result and discussion: Oxygen isotopic compositions of 263 CAIs were measured and 4 extreme ^{16}O -rich CAIs were found. Two CAIs are composed of grossite core rimmed by spinel, melilite and Ti-rich diopside layer (Figure) and others lack diopside and/or melilite. While the heterogeneous composition of grossite ($\Delta^{17}\text{O} = -36 \sim -32\text{‰}$) would be affected by altered feature of grossite, the spinel grains have uniform ^{16}O -rich composition ($\Delta^{17}\text{O} = -37\text{‰}$). If we draw a line in 3 oxygen isotope diagram with the extreme ^{16}O -rich spinel and spinel in chondrules near the CAI, the slope is in good agreement with a slope of olivine in a006 chondrule and porphiritic olivine chondrule infer that the oxygen isotopic composition of the spinel grains maintain the signature of an ^{16}O -rich end member of the Solar System.

References: [1] Sakamoto *et al.* (2007) *Science* 317, 231-233. [2] Kobayashi *et al.* (2003) *Geochemical J.* 37, 663-669. [3] Gounell *et al.* (2009) *ApJ* 698, L18-L22. [4] Krot *et al.* (2017) *GCA* 201, 185-223. [5] McKeegan *et al.* (2011) *Science* 332, 1528-1532. [6] Kawasaki *et al.* (2018) *GCA* 221, 318-341.

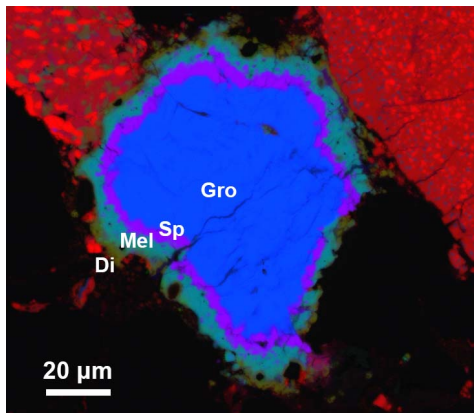


Figure Combined X-ray elemental map of an extreme ^{16}O -rich CAI 16-1-20 from Isheyevov chondrite in Mg (red), Al (green), and Ca (blue).