Oxygen isotopic study of a CAI and an Al-rich Chondrule from Vigarano

RITESH KUMAR MISHRA[1], MARIO TRIELOFF[1]

[1]Institut fur Geowissenchaften, Klaus-Tschira-Labor für Kosmochemie, Im Neuenheimer Feld 234-236 Ruprecht-Karls-Universität, Heidelberg, D 69210 Germany. email: riteshkumarmishra@gmail.com

Calcium, Aluminum-rich inclusions (CAIs) are the the earliest forming solids of the Solar system that have been U-Pb dated to ~4568 Ma [1-3]. CAIs are suggested to form during the earliest epoch (~0-2 Ma) and some may have been (re)formed/ altered during the later high temperature events [4-8]. Oxygen isotopic studies of CAIs can therefore provide information about their formation and subsequent interaction with different oxygen isotopic reservoir in the early Solar System. A large igneous type B2 CAI (Vig CAI#1) and an Al-rich chondrule from Vigarano (CV~3.1-3.4) were selected for studying their oxygen isotopic composition to understand their petrogenetic history and compare with previous studied Magnesium isotopic records of the CAI. The Al-rich chondrule is an atypical object consisting of two large (~2cm) distinct olivine grains that sandwich Al-rich phases (plagioclase, glass, spinel). Multiple traverse to the core of CAI and a few analysis within the Al-rich chondrule were made in multi collection mode using faraday cups of Secondary ion mass spectrometer 1280 HR2 at Heidelberg University. Vigarano CAI #1 has uniform oxygen isotopic composition corresponding to $\Delta^{17}O$ of ~ -1±2 permil within this large CAI of ~2 cm. The previously obtained $\delta^{25}Mg$ isotopic composition of the melilite also show the similar constant composition within the CAI. Al-rich chondrule on the other hand displays some variability amongst the olivine and Al-rich phases but has relative ^{16}O rich oxygen isotopic composition in the range of $\Delta^{17}O$ of ~-4±2 permil. Simlar oxgen isotopic composition has been observed previously in CAIs and Al-rich chondrule. $^{26}Al/^{27}Al$ of $(4.89\pm0.38)\times10^{-5}$ of Vigarano CAI #1 implies that the CAI #1 formed at ~ 0.1 Ma in a "planetary like" ^{16}O poor oxygen isotopic environment.

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