IN-SITU SIMS OXYGEN ISOTOPE MEASUREMENTS OF ZONED OLIVINES IN THE TAGISH LAKE METEORITE CHONDRULES.

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Introduction: The Tagish Lake (TL) meteorite is a brecciated carbonaceous Type 2 chondrite consisting of several lithological variations [e.g., 1,2] with different chondrule abundances [3]. CM-like specimen TL5b contains the most abundant number of chondrule-like objects up to 500 µm diameter set in a phyllosilicate-rich matrix. A large (2000 µm diameter), porphyritic type I (Fe-poor) chondrule dominated by pyroxene and olivine (Fo_{95-96}) set in a slightly altered, Al-rich mesostasis was found in 5b during processing [1]. The more altered specimen TL11i contains less chondrule-like objects and is dominated by altered matrix. This specimen contains a porphyritic chondule with zoned olivines [1]. The largest olivine has a euhedral shape and exhibits oscillatory zoning (Fo_{70-79}). Other olivine grains within this chondrule exhibit normal zoning from Mg-rich cores (Fo_{79-99}) to Fe-rich rims (Fo_{61-74}).

Methods: Oxygen analyses were obtained using a Cameca IMS1280 ion microprobe at the CCIM, utilizing a ~12 µm diameter ion Cs ion probe, and olivine reference materials for IMF correction (Fo_{75} and Fo_{93}). A Zeiss EVO 15 scanning electron microscope was utilized for microstructural characterization.

Discussion of results: Here we present first three-oxygen isotope results on olivines obtained from the CCIM facility.

Chondrule in TL5b: We have analysed a total of 14 distinct olivine grains within this chondrule, with one to four analyses on each olivine. All data form a cluster just to the left of CCAM line on a three-O isotopic plot, with the average $\Delta^{17}O$ = -2.6 (± 0.5) and mean in $\delta^{17}O$ and $\delta^{18}O$ of -1.7‰ and 1.7‰, respectively.

Chondrule in TL11i: We analysed seven zoned olivine grains (total 14 analyses). The average of eleven analyses on zoned grains (Fo_{60-79}) is $\Delta^{17}O$ = -1.73 (± 0.69). In contrast to the TL5b data, these analyses are more $^{17,18}O$-enriched and make a scattered cluster (mean $\delta^{17}O$ = 1.0 ± 0.6 ‰ and $\delta^{18}O$ = 5.3 ± 0.2 ‰) that fall on the CCAM line. Three other grains have ^{16}O-enriched relict cores. One of these olivine grains contains a relict core with diffuse boundaries and shows the most extreme Fo and $\Delta^{17}O$ differences in the core and rim amongst these olivine grains: core (Fo_{98}) has $\Delta^{17}O$ = -8.6 (± 0.68), and the rim (Fo_{71}) has $\Delta^{17}O$ = -1.9 (± 0.62). This core is more ^{16}O-enriched than data for TL from [4, 5], but not as extreme as the data on "enriched" grains by [6]. It appears that the relict cores from these three olivine grains condensed in the ^{16}O-enriched nebular environment, whereas the rims formed later in a ^{16}O-depleted environment, perhaps concurrently with other zoned olivine grains during melting and formation of this chondrule.

References: [1] Blinova A. et al. 2009. *LPSC XL*, Abstract #2039. [2] Izawa M.R.M. et al. 2010 *Planetary and Space Science*, 58:1347-1364. [3] Blinova et al. 2010. *Meteoritics and Planetary Science* 45:A17. [4] Leshin et al. 2001. *LPSC XXXII*, Abstract # 1843. [5] Russell et al. 2010 *Geochimica et Cosmochimica Acta*, 74:2484-2499. [6] Engrand et al. 2001. *LPSC XXXII*, Abstract #1568.