OXYGEN ISOTOPES IN BJURBOLE AND TIESCHITZ CHONDRULES BY UV LASER PROBE.

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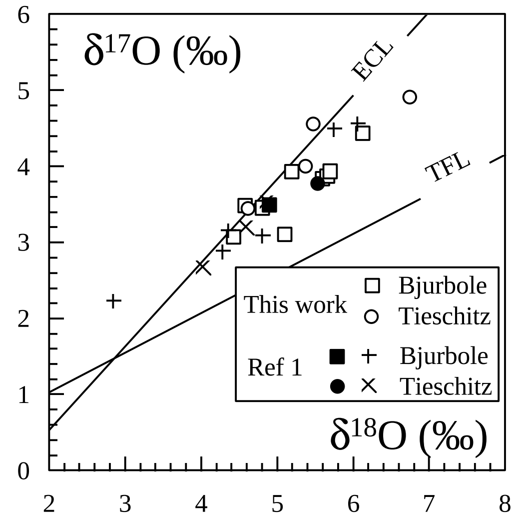
Introduction: Whilst each of the ordinary chondrite groups are clearly defined in $\delta^{17}O$ *vs* $\delta^{18}O$ space individual chondrules from these meteorites are isotopically indistinguishable [1]. The factors determining these inter- and intra-group oxygen variations remain unknown.

Some meteorites show relationships between chondrule size and oxygen isotopic composition. The largest Dhajala chondrules are depleted in ^{16}O and the smallest enriched in ^{16}O [1] whereas Chainpur seems to show the reverse trend [2]. These variations have been attributed to the interaction between chondrules and nebula gas of appropriate composition; possibly during chondrule formation. This model requires all chondrules started with a uniform composition and interacted with a homogeneous gas. This does not fit with most chondrule formation scenarios. Furthermore complications would result from multiple recycling events and chondrule reheating. Also relic grains in chondrules are not in chemical equilibrium with their host, hence would not be expected to be in isotopic equilibrium (*e.g.* ^{16}O-rich olivines [3]).

Method: Until now samples analysed have been large (greater than 1.5mm) or multi-chondrule samples. We have used the new laser microprobe (Rumble *et al*., this volume) to analyse oxygen isotopes of individual chondrules from Tieschitz (H/L 3.4) and Bjurböle (L4). Using this method we are capable of analysing smaller chondrules (<300µg), multiple spots in single chondrules and, ultimately, expect to be able to carry out high precision analyses of distinct grains within a chondrule.

Thus far oxygen isotopes of 11 chondrules (0.5 - 86mg) have been measured, eight of which have also been texturally and mineralogically characterised. By chance all chondrules analysed have textures indicative of complete melting (*i.e*. glassy/cryptocrystalline, radial olivine/pyroxene and radial pyroxene [4]).

Results: The oxygen isotopic composition of these chondrules is presented below. Also shown are data for chondrules and whole rock chondrites for the same meteorites [1] (**T**errestrial **F**ractionation **L**ine and **E**quilibrated **C**hondrite **L**ine [1] are shown for reference). The isotopic data for Tieschitz are heavier than previously reported [1] but the latter were all lighter than the whole rock (plotted as solid symbol in the figure). Bjurböle analyses lie within the field defined by [1].



Discussion: Initial results show no relationship between chondrule size, chondrule chemistry and isotopic composition over the order of magnitude size range measured here.

Although the largest Tieschitz chondrule (36.5mg) analysed thus far is the most ^{16}O poor there is no clear trend toward lighter isotopic compositions in smaller samples. Nor is there any apparent relationship between chondrule texture or chemistry and the isotopic composition.

Similarly Bjurböle shows no clearcut trends. The smallest and largest Bjurböle chondrules (1.1 and 85.6mg) have essentially identical composition ($\delta^{18}O$ of +5.70 and +5.65 and $\delta^{17}O$ of +3.99 and +3.91‰ respectively).

The similarity in textural types analysed may imply that these chondrules had similar thermal histories, hence may have offered the opportunity to observe trends related to chondrule size without the complications of differing heating regimes. At present no such trends are apparent but further analyses are underway in an attempt to clarify oxygen isotopic distribution in chondrules.

References: [1] Clayton *et al.* (1991) *GCA* **55**, 2317. [2] Bridges *et al.* (1997) *L.P.S.C.* **XXVIII** 155. [3] Saxton *et al*., (1995) *Meteoritics* **30**, 571. [4] Connolly & Hewins (1995) *GCA* **59**, 3231.