VERY HIGH PRESOLAR GRAIN ABUNDANCES IN THE CR CHONDRITE QUE 99177.

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Introduction: CR chondrites represent one of the most primitive chondrite groups and have often been compared with IDPs because both types of materials contain abundant H and N isotopic anomalies [e.g., 1, 2]. However, whereas IDPs contain abundant presolar silicates [3], such grains are very rare in CR chondrites measured to date [4, 5]. In order to explore whether aqueous alteration accounts for the lack of presolar silicates in these meteorites, we are investigating the presolar grain abundances in the CR chondrite QUE 99177, which is less altered than most members of this group [6].

Experimental and Results: We used the NanoSIMS to carry out isotopic (C and O) imaging on 8500 μm^2 of matrix material in a thin section of QUE 99177 and found 33 O-anomalous grains and 16 C-anomalous grains.

Thirty-two of the O-anomalous grains are ^{17}O-enriched and belong to group 1, with likely origins in low-mass AGB stars [7]. The remaining grain belongs to group 4 and is ^{18}O-rich. Eleven of the 16 C-anomalous grains have $^{12}C/^{13}C$ ratios between 20 and 80, similar to the ratios observed in mainstream SiC grains [e.g., 8]. The remaining 5 grains are enriched in ^{12}C, with $^{12}C/^{13}C$ ratios up to 135. Carbon isotopic compositions enriched in ^{12}C are seen in SiC Y grains but also in low-density graphite grains [8]. All of the C-anomalous grains have normal O isotopic compositions and/or are O-poor. Planned elemental (and additional isotopic) measurements will allow us to identify the carrier phases of these anomalies more accurately.

Discussion: Calculations show that QUE 99177 contains very high abundances of presolar silicate/oxide grains (~220 ppm; matrix-normalized, uncorrected for instrumental detection efficiencies). Previously the highest presolar silicate/oxide abundances have been found in Acfer 094 and ALHA77307, with (uncorrected) abundances of ~145 ppm and ~125 ppm, respectively [9]. These results indicate that the lower abundances of presolar silicates/oxides in other CR chondrites are, indeed, the result of more extensive aqueous alteration, and emphasize the primitive nature of QUE 99177.

More surprising are extremely high abundances of C-anomalous grains (~145 ppm) in this meteorite. Estimated meteoritic abundances of SiC and graphite are generally an order of magnitude or more lower [8, 10]. We note, however, that NanoSIMS C and O isotopic imaging of Acfer 094 also suggests elevated abundances of presolar carbonaceous phases [11].

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