PRESOLAR GRAIN ABUNDANCE VARIATIONS IN THE UNIQUE CARBONACEOUS CHONDRITE MIL 07687. C. Floss1 and A. J. Brearley2. 1Laboratory for Space Sciences and Physics Department, Washington University, St. Louis, MO 63130, USA. 2Department of Earth and Planetary Sciences, University of New Mexico, Albuquerque, NM, USA. (Email: floss@wustl.edu).

Introduction: Presolar silicates are easily altered or isotopically re-equilibrated by relatively modest degrees of thermal or aqueous alteration and, thus, can be useful tracers of secondary nebular and/or parent body processes [e.g., 1, 2].

MIL 07687 is an ungrouped carbonaceous chondrite with affinities to the CO chondrites, but with a unique style of partial aqueous alteration [3, 4]. Its matrix consists of distinct irregularly-shaped FeO-rich and FeO-poor regions intermingled with one another, but with clearly defined boundaries. The FeO-poor regions are texturally similar to matrix material from low petrologic type CO chondrites (e.g., ALHA77307), whereas the FeO-rich areas show evidence for aqueous alteration. However, rather than the phyllosilicates typically seen in aqueously altered chondrites, these areas are dominated by Fe-oxyhydroxides, indicative of highly oxidizing conditions [4]. Below we report on the results of our search for presolar grains in this meteorite.

Experimental: We followed standard procedures [e.g., 5] for NanoSIMS C and O ion imaging and subsequent data processing.

Results and Discussion: We analyzed a total of 33,900 µm² in six different matrix areas of MIL 07687 and identified a total of 53 O-anomalous grains. The isotopic compositions of the grains are consistent with those observed in other meteorites, with most grains belonging to either Group I or Group 4; we also identified 3 grains with highly elevated 17O enrichments (so-called ‘extreme Group 1’ grains [6, 7]). In addition, we found 28 C-anomalous grains; 21 of these are SiC, while the remaining 7 are other C-rich grains.

The overall abundance of O-anomalous grains is ~110 ± 15 ppm, consistent with the abundances determined by [8] for this meteorite; individual matrix areas range between 35 and 130 ppm. Number densities provide a more useful measure than surface area calculations for evaluating the significance of abundance variations, as they are independent of grain size. For O-anomalous grains, most of the areas we mapped have number densities between 0.18–0.20 grains/µm². However, two areas have significantly lower number densities of 0.09 grains/µm². Most of the areas targeted for the presolar grain searches are pristine and FeO-poor, but the two matrix areas with low number densities are more FeO-rich, suggesting that they have been aqueously altered and that this processing has affected abundances of presolar O-rich grains.

The overall abundance of SiC in MIL 07687 is ~85 ± 20 ppm, with individual matrix areas ranging from 15 to 190 ppm. The number densities for SiC also reflect this heterogeneity, with a factor of five variation. However, in contrast to the O-anomalous grains, there is no consistent correlation with the degree of alteration experienced by the host matrix area. This likely reflects the more refractory nature of SiC.