PRESOLAR FE OXIDE FROM THE ACFER 094 CARBONACEOUS CHONDRITE.

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Introduction: Acfer 094 is one of the most primitive carbonaceous chondrites and contains high abundances of presolar silicate grains [e.g., 1, 2]. However, little is known about the compositions of many of these grains. We are carrying out combined NanoSIMS and Auger Nanoprobe analyses of size separated fractions of Acfer 094 silicate matrix material [3] in order to investigate the elemental and isotopic compositions of both silicate and oxide grains. We have identified presolar grains from Acfer 094 on the basis of their O isotopic compositions and determined their elemental compositions [4]. Here we discuss a unique grain, 34C-10, that consists essentially only of Fe and O.

Experimental: After the presolar grains were located using NanoSIMS O isotopic imaging, the sample mount was moved to the new PHI 700 Auger Nanoprobe at Washington University for *in situ* elemental measurements. Complete elemental spectra were obtained to determine compositions and high-resolution elemental maps were acquired for selected grains [cf. 4].

Results: 34C-10 is a group 4 grain [5] that has normal $^{17}O/^{16}O$, but is enriched in ^{18}O ($^{17}O/^{16}O = 4.12 \pm 0.14 \times 10^{-4}$; $^{18}O/^{16}O = 2.68 \pm 0.04 \times 10^{-3}$). The grain is about 400 nm across, with a roughly triangular shape and appears to be an aggregate of several sub-grains. Point spectra, as well as elemental maps, show that only Fe and O are present; small amounts of Mg were seen in some spectra, but no Si, Al or Ca were detected. In order to evaluate the relative proportions of Fe and O, we compared the Auger spectra obtained on the grain with those from a magnetite standard. The results show that 34C-10 has a higher ratio of Fe to O than magnetite and is compositionally similar to wüstite (FeO).

Discussion: To our knowledge, this is the first observation of a presolar Fe-oxide grain. Wüstite and periclase (MgO) form the solid solution series magnesiowüstite ($Mg_xFe_{1-x}O$). Thermodynamic calculations show that magnesiowüstite can condense under non-equilibrium conditions and should be present in the outflows of O-rich AGB stars [6]. Moreover, this phase, specifically $Mg_{0.1}Fe_{0.9}O$, has been proposed as the carrier of the 19.5 µm emission feature observed in certain low-mass-loss AGB stars [7]. Group 4 grains have enigmatic origins with possible sources including formation in supernovae or high metallicity AGB stars. Fe isotopic measurements will be carried out to provide additional constraints on the origin of this grain.

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References: [1] Nguyen A. et al. 2007. *Astrophysical Journal* 656:1223-1240. [2] Vollmer C. et al. 2006. Abstract #1284. 37th Lunar and Planetary Science Conference. [3] Nguyen A. 2006. Ph.D. Thesis. Washington University. 194 pp. [4] Bose M. et al. 2007. This volume. [5] Nittler L. et al. 1997 *Astrophysical Journal* 483:475-495. [6] Ferrarotti A. S. and Gail H. –P. 2003. *Astronomy and Astrophysics* 398:1029-1039. [7] Posch Th. et al. 2002. *Astronomy and Astrophysics* 393:L7-L10.