AUGER ANALYSIS OF PRESOLAR SILICATES IN ACFER 094 & THE DISCOVERY OF A PRESOLAR CAI.

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Introduction: Mineralogical characterization of presolar silicates is an analytical challenge due to their small size (usually <0.5 µm) and surrounding "normal" silicates. However, such investigations are crucial in understanding formation histories of these grains [e.g. 1]. Transmission electron microscopy (TEM) is typically the method of choice, but preparation of electron transparent lamellae from meteoritic grains is a difficult and time consuming task [e.g. 2]. Auger spectroscopy provides a promising analytical alternative: elemental information of sub-µm sized grains can be obtained with ~10-20 nm resolution without elaborate sample preparation [3]. Here we report on Auger spectroscopy results of presolar silicates in Acfer 094.

Methods: Presolar silicates were identified by NanoSIMS oxygen isotope mapping at MPI for Chemistry in Mainz [4]. Auger analysis was performed at the newly installed Washington University PHI 700 Scanning Auger Nanoprobe. Up to now only qualitative results are discussed. Elemental abundance estimates are based on relative peak heights, but calibration of sensitivity factors is in progress.

Results: 9 of 31 presolar silicates are Mg-rich, 4 have similar Mg+Fe peak heights and 12 are dominated by Fe. Whereas the spectra of the Mg-rich silicates are usually very pure, those of the Fe-rich silicates appear more complex with Ca, Al or S present in some cases. Surprisingly, 5 grains contain only Si and O with little or no Fe. One 650x500 nm^2 sized grain comprises at least 3 different Ca-Al-rich minerals: it can thus be regarded as the first discovered presolar CAI.

Discussion: Equilibrium condensation theory predicts Mg-rich silicates to condense [e.g. 5] and about a third of the silicates analyzed here are of such a type. Si-rich grains probably formed in the ejecta of RGB/AGB stars with Mg/Si < 1, an abundance ratio, which is observed in ~10% of all stars [5]. Alternatively this might be a secondary effect as Mg is preferentially removed during interstellar passage [6]. TEM analysis of two Si-rich presolar silicates [2, 7] revealed a similar chemistry (up to 80 mol.% SiO_2) though no sputtering features like particle tracks are reported there. Fe-rich presolar silicates could have condensed under non-equilibrium conditions, but this heterogeneity may also be due to secondary alteration [e.g. 7] or sample contamination. Comparison of O isotopes of the presolar CAI with model calculations suggests that it condensed in the ejecta of a ~1.5$M_\odot$ red giant with lower-than-solar metallicity. Mineralogical determination of the different sub-phases is not possible at this moment, but will be the topic of a future TEM analysis.

References: [1] Messenger S. et al. 2005. *Science* 309: 737-741. [2] Vollmer et al. 2007. Abstr. 1262. *LPSC* 38. [3] Stadermann F. J. et al. 2006. Abstr. 1663. *LPSC* 37. [4] Vollmer et al. 2006. Abstr. 1284. *LPSC* 37. [5] Ferrarotti A.S. & Gail H.-P. 2001. *A&A* 371: 133-151. [6] Bradley J. P. 1994. *Science* 265: 925-929. [7] Nguyen A. N. et al. 2007. *ApJ* 656: 1223-1240.