Type: Poster Abstract language: English Abstract no.: NIC_XI_371 Created: 24 March 2010 Updated: 24 March 2010 Status: submitted

Topic

Topic: Chemical evolution and signatures of nucleosynthesis I. Pre-solar grains; ISM

Content English

Title: Stardust Material in the Meteorite SAH 97096

Abstract text:
Content
Introduction: True stardust material can be found in the form of micrometer- to sub-micrometer-sized grains in various types of solar system materials, such as meteorites, interplanetary dust particles, and comets. Carbonaceous and oxide stardust grains have been studied in the laboratory for more than 20 years [Zinner 2004, In Treatise on Geochemistry Vol. 1 (ed. A. M. Davis) pp. 17-39]. Silicate stardust is not scarce in the solar system materials but its identification was hindered because silicate stardust is embedded within an overwhelming background of isotopically normal and chemically similar silicate phases that make up the bulk of the meteoritic materials. Silicate stardust grains were discovered in the laboratory only recently when new analytical techniques for isotope imaging searches at 100nm spatial resolution became feasible [e.g., Messenger et al. 2003, Science 300, 105; Nguyen & Zinner 2004, Science 303, 1496]. Most searches for silicate stardust grains have been carried out in carbonaceous chondrites. Much less information is available about silicate stardust in enstatite chondrites; however, these meteorites are of interest because they formed under highly reducing conditions, which may allow the preferential survival of different types of silicate stardust. In addition, surviving stardust grains can provide information about conditions in the early solar nebula when these meteorites formed. Here we report searches for stardust grains in an enstatitic meteorite SAH 97096 using the Washington University NanoSIMS.
Methods: Stardust grains were identified in the NanoSIMS by rastering a Cs^+ primary beam over areas of size-separated grains of SAH 97096, and simultaneously imaging $^{12,13}C^-$ and $^{16,17,18}O^-$ ions. The elemental compositions of the isotopically anomalous grains were subsequently acquired in the Auger Nanoprobe.
Results: This study led to the identification of eight oxygen-anomalous grains. Five grains have enrichments in ^{17}O and are largely normal in their $^{18}O/^{16}O$ indicating an origin from a low-mass red giant or asymptotic giant branch star with close-to-solar or slightly lower-than-solar metallicity and about 1.1-2.5 M_{Sun} [Nittler et al. 1997, ApJ. 483, 475]. One grain has a $^{17}O/^{16}O$ ratio of $(1.33\pm0.01)\times10^{-2}$ and an $^{18}O/^{16}O$ ratio of $(1.43\pm0.04)\times10^{-3}$; for such a composition Nittler et al. [2008, ApJ. 682, 1450] suggested a possible origin in binary star systems, in which material was transferred from an evolved star or a nova explosion to a main sequence star. Two grains show enrichments in ^{18}O and have oxygen isotopic compositions consistent with formation in supernova ejecta. Elemental compositions of the stardust grains will be presented at the symposium. We also identified four grains with carbon anomalies; their $^{12}C/^{13}C$ ratios range from 19 to

78, similar to the compositions of mainstream SiC grains. The conditions under which these stardust grains formed and/or were subsequently modified will also be evaluated.

Keywords: -

Authors

Author(s): Bose, M. [1], Floss, C. [1], Stadermann, F. [1] Institutes:

- [1] Washington University, Laboratory of Space Sciences and Physics Department, Saint Louis

---

First mentioned author: Bose, Maitrayee Presenting author(s): Bose, Maitrayee
Submitting author: Bose, Maitrayee