THE ISOTOPIC NATURE OF GEMS IN INTERPLANETARY DUST PARTICLES. F. J. Stadermann[1] and J. P. Bradley[2], [1]Laboratory for Space Sciences and Physics Department, Washington University, St. Louis, MO 63130, USA, fjs@wuphys.wustl.edu, [2]Institute for Geophysics and Planetary Physics, Lawrence Livermore National Laboratory, Livermore, CA 94550, USA, jbradley@igpp.ucllnl.org.

Introduction: An abundant component of anhydrous interplanetary dust particles (IDPs) are sub-micrometer glassy objects with embedded metal and sulfide grains (GEMS). These objects are interesting because they may be the irradiated remnants of cosmically abundant interstellar silicate grains [1] with which they share many infrared spectral properties [2]. A positive proof that GEMS are interstellar in origin and not a product of the early solar system would be the observation of clearly nonsolar isotopic abundances, although the absence of such anomalies would not disprove a presolar origin. The first analytical tool for isotopic measurements of individual GEMS, the NanoSIMS, has only recently become available [3] and indeed a study of O isotopic compositions in IDPs has found isotopic anomalies in a small portion (2 out of 42) of GEMS [4]. The majority of GEMS, however, appear normal with respect to their O isotopic composition, possibly due to exchange with isotopically normal material. In order to better understand the isotopic nature of GEMS, we have studied a large number of GEMS-rich TEM sections of IDPs with the NanoSIMS. The results of imaging measurements of the C, N, O, Si, and S isotopic compositions in these particles and aspects of the sample mounting routines will be discussed.

Analytical Methods: The detailed mineralogical compositions of 16 slices from 3 chondritic, anhydrous IDPs were determined with the transmission electron microscope (TEM). These samples were selected for their high concentration of GEMS and each TEM section contained many individually identified GEMS. After the mineralogical studies, the entire TEM grids were mounted for NanoSIMS measurements. Isotopic measurements were made in multicollection imaging mode where up to 5 secondary ion species plus secondary electrons were analyzed simultaneously. Most sample sections were destroyed during the measurements, which typically take several hours. Whenever useable samples remained after the first measurement, the same sections were used for additional measurements of other isotopic systems. Results were then converted into isotope ratio images to allow a direct subgrain by subgrain comparison with the corresponding TEM images.

Results: No large isotopic anomalies –as seen in other IDP studies [4, 5]– were observed in any of the C, N, O, Si, and S isotopic measurements of the GEMS. Several sections do show isotopic variations that are marginally statistically significant. Detailed data processing will be required to isolate such grains from the surrounding areas of the sample with solar isotopic compositions. If indeed GEMS are of presolar origin but contain mostly isotopically normal material, a better understanding of grain processing and isotopic exchange in the interstellar medium and solar nebula is required.

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