SIMULTANEOUS ANALYSES OF TITANIUM AND MOLYBDENUM ISOTOPIC COMPOSITIONS IN PERSOLAR SIC GRAINS.

R. Trappitsch[1], W.-J. Ong[2], C. J. Dory[2], D. Z. Shulaker[2], M. Lugaro[3], M. R. Savina[2], P. K. Weber[2], B. H. Isselhardt[2], and S. Amari[4], [1]Department of Physics, Brandeis University, Waltham, MA, USA (reto@brandeis.edu), [2]Nuclear and Chemical Sciences Division, Lawrence Livermore National Laboratory, Livermore, CA, USA, [3]Konkoly Observatory, Research Center for Astronomy and Earth Sciences, Budapest, Hungary, [4]McDonnell Center for the Space Sciences and Physics Department, Washington University, St. Louis, MO, USA.

Introduction: Presolar SiC mainstream grains have long been identified as the condensation products of stellar winds from asymptotic giant branch (AGB) stars. These grains are therefore ideal proxies to study *s*-process nucleosynthesis [e.g., 1,2]. On the other hand, certain elements in these stardust grains have not been significantly altered by stellar processes and the isotopic composition therefore represents an avenue to study galactic chemical evolution (GCE) [e.g., 3,4]. Recent work [5,6] showed, in contrast to previous models, that mainstream SiC grains likely originated from parent stars with solar to super-solar metallicity. Here we present correlated titanium and molybdenum isotopic analyses that allow us to directly correlate a GCE dominated element with a typical *s*-process one in individual stardust grain to directly test the hypothesis if mainstream SiC grains indeed predominantly originated from metal-rich AGB stars.

Methods: Presolar SiC grains from the KJF separation of the Murchison meteorite [7] with nominal sizes between 0.8 and 1.5 µm were mounted on ultra-pure gold foil and were subsequently pressed into the gold using a sapphire window. This mount was then mapped by SEM/EDX to detect SiC grains, which were subsequently analyzed for their carbon and silicon isotopic composition on the NanoSIMS 50 at Lawrence Livermore National Laboratory (LLNL). Subsequently, individual SiC grains were analyzed with the Livermore Laser Ionization Of Neutrals (LION) resonance ionization mass spectrometer (RIMS) simultaneously for their titanium and molybdenum isotopic compositions. Here we present measurements of a total of 25 presolar SiC grains.

Results: Isotope measurements of carbon and silicon compositions of the analyzed stardust grains agree well with the mainstream grain SiC group [e.g., 8]. The molybdenum isotopic measurements furthermore agree with measurements by Stephan et al. [9]. The uncertainties of the measurements obtained in this study on LION are similar to the uncertainties of the high-precision measurements obtained by [9], which were measured with the Chicago Instrument for Laser Ionization (CHILI), especially when considering that we analyzed a smaller presolar SiC grain fraction compared to the study by [9]. The overall trends in the titanium isotopic compositions of the analyzed stardust grains also agree well with literature results [e.g., 3].

Discussion & Outlook: Comparing our molybdenum isotope measurements with stellar models [5,6] shows good agreement of measurements and models. The stellar models show that only a slight change of up to approximately 20‰ is expected in $\delta(^{46}Ti/^{48}Ti)$ with respect to the solar composition. The measurements of $^{46}Ti/^{48}Ti$ in presolar grains, which show an enrichment in $^{46}Ti/^{48}Ti$ compared to solar of up to several 100‰, therefore show a clear GCE signal. Analyzing titanium and molybdenum simultaneously thus allows us to study GCE along with *s*-process nucleosynthesis. GCE models, e.g., by Kobayashi et al. [10], predict a rising $^{46}Ti/^{48}Ti$ ratio with increasing metallicity, therefore, this isotope ratio can be used as a metallicity proxy. A preliminary evaluation of our measurements indicates that the effect of the *s*-process, as measured with respect to the $^{92}Mo/^{96}Mo$ isotope ratio, decreases with increasing metallicity. A detailed comparison of our findings with stellar models is currently ongoing.

Acknowledgement: This work was performed under the auspices of the US Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344 and was supported by the LLNL-LDRD Program under Project 20-ERD-030. LLNL-ABS-823152.

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