Contribution ID: **52** Type: **Oral (in presence)**

Molybdenum, ruthenium, and barium isotopes in presolar silicon carbide and graphite

Wednesday 22 June 2022 09:50 (25 minutes)

We have measured Mo, Ru, and Ba isotopes in 49 presolar SiC and 11 high-density graphite grains from the Murchison meteorite with the Chicago Instrument for Laser Ionization (CHILI), a microbeam laser resonance ionization mass spectrometer. Each of these elements has seven stable isotopes, which allow study of *s*-, *r*-, and *p*-process products. Correlated nucleosynthetic effects observed for several elements in single grains can provide tighter constraints for modeling of their parent stars.

All SiC grains were classified using C, N, and Si isotopic measurements with the NanoSIMS at MPIC. Of the 49 grains, 40 were mainstream (M), three Y, one Z, one X1, and four AB (one AB1 and three AB2). Only six of the graphite grains had NanoSIMS C and N isotope data available.

CHILI's six tunable Ti:sapphire lasers allow simultaneous analysis of three elements, each with independent two-photon resonance ionization schemes. Molybdenum and Ru isobars were separated by firing respective ionization lasers on alternate desorption laser shots. Barium ionization lasers were fired together with the Ru lasers.

Molybdenum was detected in all 49 SiC grains, confirming previously reported trends for SiC grain types, except for the AB1 grain, which showed slight *r*- and *p*-process isotope enrichments. Ruthenium was detected in 38 SiC grains (30 M, three Y, one Z, and four AB) and showed *s*-process-dominated isotope patterns for all grains except the AB1 grain, which showed similar slight *r*- and *p*-process enrichments for Ru. The Ru and Mo *s*-process isotope enrichments for all other grains are strongly correlated. At least some Ba isotopes were detected in 23 of the SiC grains (20 M, one X1, and two AB2), also confirming previously observed trends. The X1 grain showed a neutron burst isotopic signature for Mo and a strong enrichment of ^{138}Ba, as has been observed in X grains before.

The graphite grains suffered from strong surface contamination with terrestrial or solar Mo, and the majority had no detectable Ru and Ba. We suspect the Mo contamination is related to the reagents used during separation of the grains from the host meteorite. Only one graphite grain showed clear *s*-process signatures in Mo, Ru, and Ba.

The correlated *s*-process enrichments of Mo, Ru, and Ba in presolar grains link these grains to low-mass asymptotic giant branch (AGB) stars. Subtle differences between individual grains, especially in Mo, point towards variations in relative *s*-process yields for individual isotopes.

Session

Dust and presolar grains

Author: STEPHAN, Thomas (The University of Chicago)

Co-authors: BLOOM, Hannah E. (The University of Chicago); HOPPE, Peter (Max Planck Institute for Chemistry); DAVIS, Andrew M. (The University of Chicago); KORSMEYER, Julie M. (The University of Chicago); REG-

ULA, Andrew (The University of Chicago); HECK, Philipp R. (Field Museum of Natural History); AMARI, Sachiko (Washington University in St. Louis)

Presenter: STEPHAN, Thomas (The University of Chicago)

Session Classification: Dust and presolar grains