TUNGSTEN ISOTOPIC COMPOSITIONS IN PRESOLAR SILICON CARBIDE GRAINS.

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Introduction: The *s*-process nucleosynthesis in the Hf-Ta-W-Re-Os path has received considerable attention lately. New neutron capture cross sections for ^{174,176,177,178,179,180,182}Hf, ^{185}W and ^{186,187,188}Os have been reported [1-4], and small anomalies in W and Os isotopes have been observed in primitive meteorites [5-7]. However, as suggested by [2; 3], model calculations for *s*-processes nucleosynthesis appear to underestimate ^{182}W and overestimate ^{186}Os, and this may have implications for the ^{182}Hf-^{182}W and ^{187}Re-^{187}Os chronometers. Tungsten isotopes are particularly important because they are affected by several branching points (^{182}Ta, ^{181,182}Hf, and ^{185}W), which also affect Re and Os isotopes. Here we report, for the first time, W isotopic measurements in presolar SiC grains in order to provide additional constraints on *s*-process nucleosynthesis.

Experimental: ^{182,183,184,186}W and ^{180}Hf were measured with SHRIMP RG at ANU in an aggregate of presolar SiC grains (KJB fraction) extracted from the Murchison meteorite [8]. Tungsten isotopes were measured as WO^+ ions, which have a higher yield than the atomic species ($WO^+/W^+ \sim 3$). An O^- primary ion beam of 5 nA was focused to sputter an area of 20 μm in diameter. SHRIMP RG was operated at a mass resolving power of $m/\Delta m = 5000$ (at 1% peak). At this level, isobaric interferences were well resolved from the WO^+ species. NIST silicate glasses and synthetic SiC were used to monitor instrumental mass fractionation and isobaric interferences.

Results and Discussion: The W isotopic compositions are anomalous in comparison to those observed in normal solar system materials. The SiC grains appear to be enriched in ^{182}W and ^{184}W relative to ^{183}W, as expected for *s*-process nucleosynthesis in AGB stars [e.g. 5]. However, an unexpected enrichment in ^{186}W is observed. The low ^{180}Hf/^{183}W ratios determined here imply a low contribution from radiogenic ^{182}W after SiC condensation, otherwise the ^{182}W excesses would be even higher. The observed enrichment in ^{186}W requires the activation of the ^{185}W branching point during AGB thermal pulses, when marginal activation of the ^{22}Ne(α,*n*)^{25}Mg source produces neutron densities as high as $N_n = 5 \times 10^9$ neutrons cm^{-3} [9], bypassing ^{186}Os. This result is in disagreement with ^{96}Zr depletions in SiC grains that indicate that the ^{22}Ne(α,*n*)^{25}Mg source was weak in their parent stars.

Production and destruction of W isotopes by cosmic rays still need to be investigated, especially for samples, such as presolar grains, exposed for a long time to galactic cosmic radiation.

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