PLATINUM-H IN PRESOLAR NANODIAMOND

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Introduction: Among the presolar grains in meteorites, nanodiamonds are still the most enigmatic. Partly this is due their small size, which would render results from single grain analyses - even if they were possible – of limited value. Another reason is the low abundance of trace elements [1]. In acid resistant-residues that also contain "impurities" of presolar silicon carbide, the trace element pattern is dominated by the SiC contribution for many elements, in particular in the REE range [2]. The most distinctive isotopic patterns linking the diamonds to a supernova have been observed in the noble gases, in particular xenon [3, 4]. This has been supplemented by large effects observed in tellurium [5], and smaller not so telling effects in a few other elements (Sr, Ba, Pd: [6, 7]).

Experimental: We have been continuing our search for isotopic effects in platinum. As in [8], we use accelerator mass spectrometry, which eliminates molecular interferences, a problem encountered in our multi-grain multi-element study by ICP-MS [2]. AMS is also able in principle to distinguish between true isobars, but this has not been necessary in our case. Ignoring low-abundant ^{190}Pt and ^{192}Pt, the only interfering isobars are at masses 196 and 198 from volatile Hg, which is not present in the beam when using negative ions. Measurements were performed at the Vienna Environmental Research Accelerator (VERA) [9] using similar methods as in our previous work at TU Munich [8]. VERA has recently been optimized for heavy ion detection, resulting in improved precision and background suppression.

Results: We observed enhancements in ^{198}Pt/^{195}Pt by ~6 % in two diamond residues from Allende, AKL and AMW, which were prepared by different dissolution techniques [8]. Analyses were run in two different analytical sessions and the effect was reproduced. Variations in other isotopic ratios were within analytical uncertainty, and no anomaly could be identified in a third Allende diamond sample.

Interpretation: Enhanced ^{198}Pt/^{195}Pt is predicted by both the neutron burst model [10] and the rapid r-process separation scenario [11]. However, the latter also predicts a strong negative anomaly in ^{194}Pt/^{195}Pt, which is not observed. Thus, the Pt results seem to favor the neutron burst model. This is in contrast to the situation in tellurium (and xenon, to some extent) and adds to the enigma of the nanodiamonds.

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