S-PROCESS Ba AND Nd IN PRESOLAR MURCHISON SiC; **E. Zinner[1], S. Amari[1,2] and R. S. Lewis[2],** [1]McDonnell Center for the Space Sciences and the Physics Dept., Washington University, One Brookings Drive, St. Louis, MO 63130-4899, [2]Enrico Fermi Institute, University of Chicago, 5630 Ellis Ave., Chicago, IL 60637-1433.

Ott and Begemann [1] have shown that a chemical separate from Murchison contains Ba with an s-process component. Here we report ion microprobe isotopic measurements of Ba in six and Nd in one SiC grain size fractions from Murchison [2]. The measurements were made on several aggregates per separate with high energy secondary ions to suppress molecular interferences [3]. The Ba data were corrected for ^{136}Ce and ^{138}Ce, by monitoring ^{140}Ce and assuming the same s-process/solar mixing ratio for Ce as that for Ba, and for an instrumental mass fractionation of $-6.5^0/_{00}$/amu determined from the analysis of Ba in synthetic SiC. The Ce corrections are smaller than measurement errors for any assumed mixing ratio for Ce.

The results are displayed as 3-isotope plots (Figures 1-3) relative to ^{136}Ba together with the measurements Ott and Begemann [1] and their extrapolated pure s-process compositions. Some of the aggregates had been analyzed previously with a Cs^+ beam. Since the implanted Cs would give rise to a CsH^+ interference to $^{134}Ba^+$, these measurements are not plotted in Fig. 1. In Figs. 1 and 2 the SiC data points lie on single lines indicating *mixing between a component with solar composition* (δ^iBa ≡ 0) *and a single s-process component.* They clearly favor case 2 of Ott and Begemann [1], i.e. a ^{134}Ba/^{136}Ba *ratio different from solar.* In Figure 3 only the two finest SiC separates lie on a line through the case 2 endpoint (solid line). Coarser fractions deviate from this line as indicated by mixing lines for KJD, KJE and KJF. While we cannot absolutely rule out molecular interferences, it is unlikely that they can account for the observed deviations because (a) they would have to conspire to preserve the correlation in Fig. 2, and (b) increases in the energy of secondary ions that should have resulted in decreased molecular interferences do not change the deviations. Model calculations for the He-burning shell of AGB stars by Gallino *et al.* [4] predict larger changes for the ^{138}Ba/^{136}Ba ratio with varying metallicity than for the other s-process Ba isotopic ratios, but the predicted ratios themselves don't agree too well with the measurements (e.g. ^{137}Ba/^{136}Ba is predicted to vary between 1.09 and 1.35 whereas our lowest measured (not extrapolated) value is 0.76). Furthermore, the trend for the ^{138}Ba/^{136}Ba ratio, namely increasing metallicity [4] for increasing grain size of SiC is just opposite the trend shown by the Kr-isotopic data [2,5]. If case 2 represents the correct endmember in Fig. 2, ^{136}Ba in KJB and KJC is 90% *pure s-process Ba.* We cannot yet decide whether the isotopically normal endmember represents Ba from the envelope of the AGB star or Ba from contamination. Si-isotopic data on the same SiC separates [6] indicate that only 2-3 % of He-shell Si was mixed with normal Si in the envelope. If Ba/Si is solar in the envelope that implies *Ba/Si ≈ 250-450× solar in the He-shell,* in good general agreement with the model [4].

Nd isotopes were measured in KJB (0.1-0.2 μm) under the same analytical conditions as for Ba. The data were corrected for ^{144}Sm and ^{142}Ce, by monitoring ^{147}Sm and ^{140}Ce and again by assuming the same s-process/solar mixing ratio for Sm and Ce and endmember compositions of $-420^0/_{00}$ and $-500^0/_{00}$ for $\delta(^{145}Nd/^{144}Nd)$, as well as an instrumental mass fractionation of $-5.6^0/_{00}$/amu. The results are given in Figure 4-6 as 3-isotope plots relative to ^{144}Nd. The ^{144}Sm corrections are much smaller than analytical errors for any assumed Sm-S/solar mix for Sm. This is not the case for the ^{142}Ce corrections, and the ^{142}Nd/^{144}Nd corrected compositions for both assumed endmembers are shown in Figure 4. Also shown in the figures are compositions predicted by Howard *et al.* [7] and from $N_S \cdot \sigma$ = const. [8]. Since the error bars on the cross sections are fairly large, our data agree with theoretical expectation for Figures 4 and 6

but deviate significantly for δ^{143}Nd vs δ^{145}Nd in Figure 5.

References: [1] U. Ott and F. Begemann (1990) *Ap. J.* **353**,L57; [2] R. Lewis *et al.* (1990) *Nature* **348**,293; [3] E. Zinner and G. Crozaz (1986); [4] R. Gallino *et al.* (1990) Priv. Comm.; [5] R. Gallino *et al.* (1990) *Nature* **348**,298; [6] S. Amari *et al.* (1991) This volume; [7] W. Howard *et al.* (1986) *Ap. J.* **309**,633; [8] F. Käppeler *et al.* (1989) *Rep. Prog. Phys.* **52**,945.