RARE PRESOLAR SILICON CARBIDE GRAINS FROM NOVAE: AN AUTOMATED SEARCH BY NANOSIMS.

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Introduction: The very rare nova grains were traditionally attributed to condense in the ejecta of ONe novae, based on the qualitative agreement of their isotopic composition with models [1,2]. However, we recently reported grain data, which are qualitatively consistent with CO nova model predictions [3]. Another recent study of putative nova grains found supernova-only produced nuclides and hereby excluding a nova origin [4].

Our main goal is to examine the general validity of these findings by applying an automated grain search and analysis technique on a large number of presolar SiC with the NanoSIMS ion microprobe combined with noble gas analyses. C- and N-isotopes are used to identify nova grain candidates, while Ne-isotopes can be used to discern between CO and ONe nova grains. The presence of radiogenic supernova isotopes would exclude a nova origin. At the conference, we will present results of this ongoing study of so far 1089 analyzed presolar SiC grains.

Samples and Experimental: Using a standard procedure [5] SiC was extracted from Murchison. The sample preparations and NanoSIMS setup is described elsewhere [3]. Our automated procedure [3,6] primarily consists of the following steps: presputtering to remove surface contamination, raster image (50 x 50 μm^2) acquisition, particle recognition, single grain analysis. Grains of interest will be analyzed manually for radiogenic supernova isotopes and/or He- and Ne-isotopes. SiC from Murchison and Murray from our first study [7] are also included in the data set.

Results: We have found 979 SiC grains from a total of more than 1000 automatically recognized particles. The $^{12}C/^{13}C$ and the $^{14}N/^{15}N$ ratios span the range from 3.7 to 420 and from 26 to 1400, respectively. We classify 19 grains as type A/B, 3 of them having very low $^{12}C/^{13}C$ ratios (<5). Our manual study of 110 presolar SiC grains revealed 5 A/B type grains, with 1 grain having a $^{12}C/^{13}C$ ratio < 5. This gives us 4 out of 1089 grains with particularly low $^{12}C/^{13}C$ ratios, which have $^{14}N/^{15}N$ ratios > 200.

Discussion and Conclusion: The C- and N-isotopic compositions of these 4 grains are qualitatively consistent with a CO nova model prediction. For grain SiC070 also the Ne- and Si-isotopic compositions agree qualitatively with this prediction. The analysis of Ne-, Mg- and Ca-isotopes will be diagnostic for the determination of the stellar sources of the grains.

The study of a large number of presolar SiC with our automated search and analyses technique turned out to be efficient. We are confident to discover more nova grain candidates and elucidate their true origin.

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