Isotopic compositions of small presolar dust grains

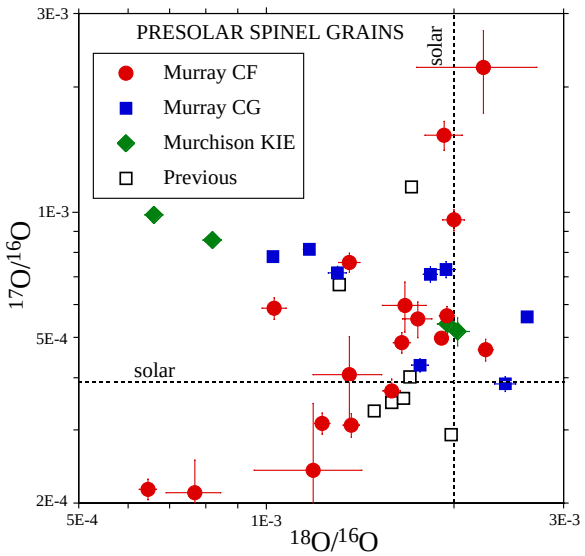
E. ZINNER, S. AMARI, R. GUINNESS, A. NGUYEN AND F. J. STADERMANN

Laboratory for Space Sciences and the Physics Department, Washington University, One Brookings Drive, St. Louis, MO 63130, USA (ekz@howdy.wustl.edu)

The last ten years have seen the accumulation of a wealth of isotopic data on presolar dust grains obtained with the ion microprobe [e.g., 1]. Most of these measurements were performed on grains ≥1 µm in size. A new type of ion probe, the NanoSIMS, with its high sensitivity and high spatial resolution [2] offers the opportunity to analyse much smaller grains, in the size range typical for interstellar dust.

We have initiated a series of NanoSIMS presolar grain studies that exploit these new capabilities. In one example we have extended C and N isotopic measurements to much smaller SiC grains by analysing grains from Murchison separate KJB (grain diameters 0.25–0.45µm) and Indarch IH6 (0.25–0.65µm) [3]. The distributions of the C and N isotopic ratios are quite similar to those of larger (1.8–3.7µm) grains from Murchison separate KJG [4, 5], the only difference being a higher fraction of grains with $10<{}^{12}C/{}^{13}C<40$. Indarch IH6 contains also Si_3N_4 grains and we tentatively identified some of them as presolar with isotopic characteristics similar to mainstream SiC grains.

Another study is concerned with O isotopic measurements of small spinel grains [6, 7]. The abundance of >1µm presolar spinels is very low and before the start of our study only 7 such grains had been identified. We analysed spinels from Murray CF (average size ~0.15µm), Murray CG (~0.45µm) and Murchison KIE (~0.5µm) and identified 30 presolar grains (Figure 1). The abundance of presolar spinel is ~3% among the smallest size fraction (CF), much higher than among larger grains.



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