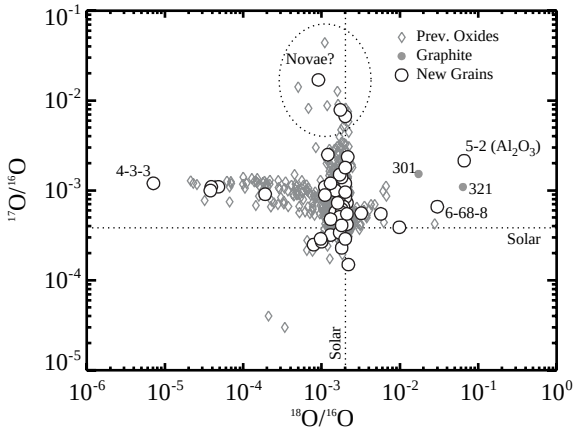
EXTREME O ISOTOPIC ANOMALIES IN PRESOLAR OXIDES FROM THE MURRAY CM2 CHONDRITE.

L. R. Nittler[1], F. Gyngard[1], and E. Zinner[2]. [1]Department of Terrestrial Magnetism, Carnegie Institution of Washington, Washington, DC 20015, USA. E-mail: lnittler@ciw.edu. [2]Laboratory for Space Sciences and Department of Physics, Washington University, St. Louis, MO 63130, USA.

Introduction: O-rich stardust grains found in primitive meteorites provide information about a wide range of astrophysical environments. Based on their O isotopic ratios, these grains can be placed into discrete groups, thought to reflect distinct stellar sources [1], such as low-mass AGB stars and supernovae (SNe). However, measurements of sub-μm presolar oxides have revealed sub-populations with extreme anomalies (e.g., large ^{17}O and/or ^{18}O enrichments) pointing to distinct stellar sources [2, 3]. Here we report the discovery of more such exotic presolar oxides.

Methods: Grains (of average size 450 nm) from the Murray CG acid residue [4] were automatically analyzed for ^{12}C, $^{16,17,18}O$, $^{24}Mg^{16}O$, and $^{27}Al^{16}O$ in multi-detection with the Carnegie NanoSIMS 50L using the system described in [2]. High-resolution SEM images and EDX spectra were obtained in order to confirm the grains' mineralogy and establish that the grains measured automatically were single grains. In cases where they were not, isotopic ratios were calculated from $^{16,17,18}O$ ion images.

Results: The Figure shows O-isotopic ratios for 49 new presolar oxides; an additional 58 identified grains are multiple grains that still require follow-up analysis. Most grains are spinel and have compositions similar to those of previous presolar oxides. However, of particular interest are: grains with the largest ^{18}O excesses (5-2 and 6-68-8) and depletions (4-3-3) yet observed in O-rich stardust, and three grains with ^{17}O enrichments indicative of formation in nova ejecta [2]. The two most ^{18}O-rich grains lie intriguingly close to two presolar graphite grains thought to have a SN origin [5]. Additional isotopic measurements of the unusual grains should help us to better unravel their origins.



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