EVIDENCE FOR NEUTRON CAPTURE AT HIGH NEUTRON DENSITY IN PRESOLAR GRAINS

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Presolar grains contain evidence for neutron capture at neutron densities between those of the s-and r-process. The Mo isotopic pattern of presolar SiC grains of Type X [1] has been explained by a short neutron burst [2]. SiC grains of Type C have large ^{29}Si and ^{30}Si excesses and evidence for short-lived ^{32}Si from large ^{32}S excesses [3]. Formation of ^{32}Si requires high neutron densities. Both types of grains likely originated in core-collapse supernovae, where high neutron densities can be generated from the ^{22}Ne neutron source at high temperatures during the core-collapse SN explosion. In the12M $_{\odot}$model by Woosley and Heger [4] a region with large ^{32}Si excesses is found at the boundary of the C/O and He/C zone, whereas in the model by Pignatari et al. [3] such a region is found at the bottom of the He/C zone. This region also reproduces the Mo isotopic pattern of X grains. A few SiC grains of Type AB [5] as well as a few ungrouped (U) grains with ^{29,30}Si excesses have shown 32S excesses indicating the initial presence of ^{32}Si. These grains have low ^{12}C/^{13}C ratios, which cannot be easily explained by core-collapse SNe. A more likely origin are post-AGB stars experiencing a very late thermal pulse (born-again AGB stars). In models of such stars high neutron densities are produced by the ^{13}C neutron source resulting from the ingestion of H from the residual envelope into the ^{12}C-and ^{4}He-rich intershell (i-process) [6]. Such a process can also explain the large Ca and Ti isotopic anomalies of high-density presolar graphite grains with low ^{12}C/^{13}C ratios [7].

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