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STELLAR ORIGINS OF 13C- AND 15N-ENRICHED PRESOLAR SIC GRAINS

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Extreme excesses of ^{13}C ($^{12}C/^{13}C<10$) and ^{15}N ($^{14}N/^{15}N<20$) in rare presolar SiC grains have been considered diagnostic of an origin in classical novae [1], though an origin in core-collapse supernovae (CCSNe) has also been proposed [2]. We report multi-element isotopic data for 19 ^{13}C- and ^{15}N-enriched presolar SiC grains ($^{12}C/^{13}C<16$ and $^{14}N/^{15}N<\sim150$) from an acid-resistant residue of the Murchison meteorite. These grains are enriched in ^{13}C and ^{15}N, but with quite diverse Si isotopic signatures. Four grains with $^{29,30}Si$ excesses similar to those of type C SiC grains likely came from CCSNe that experienced explosive H burning occurred during their explosions [3]. The independent coexistence of proton- and neutron-capture isotopic signatures in these grains strongly supports heterogeneous H ingestion into the He shell in at least some pre-supernova massive stars. Also, we found that seven ^{15}N-enriched AB grains ($\sim25<^{14}N/^{15}N<\sim150$) have distinctive isotopic signatures compared to eight putative nova grains with ^{30}Si excesses and ^{29}Si depletions, such as higher $^{14}N/^{15}N$, lower $^{26}Al/^{27}Al$, and lack of ^{30}Si excess, indicating weaker proton-capture nucleosynthetic environments. Interestingly, two of the eight putative nova grains and four of the seven ^{15}N-enriched AB grains show lower-than-solar $^{34}S/^{32}S$ ratios that cannot be explained by classical nova nucleosynthetic models. We discuss these signatures within the CCSN scenario.

[1] S. Amari *et al.*, ApJ **551**, 1065 (2001).
[2] L. R. Nittler & P. Hoppe, ApJ **631**, L89 (2005).
[3] M. Pignatari *et al.*, ApJ **808**, L43 (2015).