CARBON-RICH DUST FROM SUPERNOVAE: THE FIRST CONNECTION WITH GALACTIC CHEMICAL EVOLUTION

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A fraction of C-rich presolar grains found in pristine carbonaceous meteorites are identified as relics of old core-collapse supernovae (CCSN), according to their anomalous isotopic abundances. These grains include silicon carbides (SiC) of Type-X and Type-C, and low-density graphites [1]. The established scenario to explain their measured isotopic abundances is to assume mixing of C-rich He-shell material with deeper Si-rich zones of the star. While this possibility seems to explain a number of observables (e.g., the ^{28}Si and ^{44}Ti enrichments), it is challenged by a number of other observations [2]. We recently showed that the isotopic anomalies observed in C-rich dust from CCSNe may be explained instead without any ad-hoc mixing, but as a signature of explosive He-burning and of the consequent neutron burst [3,4]. In this scenario the isotope abundances in SN C-rich dust are those of only the much more limited C-rich zone of the CCSN ejecta, drastically increasing their power to contrain CCSN nucleosynthesis models. These constraints can also be used now to obtain fundamental insights for the Galactic chemical evolution of several isotopes, among others the CNO species. In particular, we will discuss the example of ^{15}N, whose origin in the Galaxy is not well understood.

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[2] K.K. Marhas et al., ApJ 689, 622 (2008).
[3] M. Pignatari et al., ApJL 767, 22 (2013).
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