

s-Processing from MHD-induced mixing and isotopic abundances in presolar SiC grains

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In the past years the observational evidence that s-process elements from Sr to Pb are produced by stars ascending the so-called Asymptotic Giant Branch (or “AGB”) could not be explained by self-consistent models, forcing researchers to extensive parameterizations. The crucial point is to understand how protons can be injected from the envelope into the He-rich layers, yielding the formation of ^{13}C and then the activation of the $^{13}\text{C}(\text{n},\text{n})^{16}\text{O}$ reaction. Only recently, attempts to solve this problem started to consider quantitatively physically-based mixing mechanisms. Among them, MHD processes in the plasma were suggested to yield mass transport through magnetic buoyancy. In this framework, we compare results of nucleosynthesis models for low mass AGB stars ($M < 3M_{\odot}$), developed from the MHD scenario, with the record of isotopic abundance ratios of s-elements in presolar SiC grains, which were shown to offer precise constraints on the ^{13}C reservoir. We find that n-captures driven by magnetically-induced mixing can well account for the SiC data and that this is due to the fact that our ^{13}C distribution fulfils the above constraints rather accurately. We show comparisons between model predictions and measurements for isotopes of Sr, Zr and Ba as representative examples of light and heavy s-elements.

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