IMPLANTATION AND CONCENTRATION PROFILES OF TRACE ELEMENTS IN PRESOLAR SIC TYPE X GRAIN

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We investigate the effects of temperature and relative velocities on Cr and Zn ions' implantation in presolar SiC grains generated in the outer envelopes of supernova from the time they condense (~800-1500 days after explosion) till the onset of Rayleigh Taylor phase (few hundred years). We also estimate the concentrations of stable isotopes of these elements implanted into a micron sized grain by constructing an ion implantation model using nucleosynthesis data from KEPLER[1] of type II core collapse supernovae. We use this model together with a high accuracy ion target simulator SDTrimSP[2] to calculate the amount of Cr and Zn ions implanted at various depths for a micron sized grain at temperatures of 300K, 1200K and 1600K.

Our calculations indicate central concentrations (in ppm) of 2.8 and 0.2 for ^{52}Cr and ^{64}Zn (relative velocity ~1000 kms^{-1}) for a grain condensed in the mid-He zone[1] of 15.2M$_{\odot}$ star, while assuming penultimate zonal mixing as 1%[3] and differential zonal velocity as 2000 kms^{-1}. This is in agreement with the extremely low concentrations observed for trace elements in presolar grains embedded in meteorites. We also find implantation remains fairly independent of temperature (provided T<2000K) for slow moving ions (velocities <2500kms^{-1}), however, it decreases by as high as 90% for fast moving ions.

[1] Sukhbold (2016), *ApJ*, **821**:38. [2] Mutzke (2011), IPP Report 12/8, MPG. [3] Marhas (2008), *ApJ* **689**, 622-645.