Nucleosynthesis in neutron rich neutrino-driven winds: Impact of (α,n) reactions on abundances from Sr to Ag

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Neutrino-driven winds from nascent neutron stars following Supernovae explosions have been proposed as a possible source of "light" r elements" (from Sr through Ag with A~88-110). In these events, (α,n) reactions occurring after the temperature has dropped out of nuclear statistical equilibrium are key to move matter beyond the so-called iron group towards the region of heavier proton number.

Due to the lack of experimental measurements, the relevant reaction rates have mostly (if not exclusively) been calculated with codes based on the statistical Hausher-Feshback model. Although these codes have been satisfactorily cross checked with experimental data in regions near stability, their accuracy is more questionable as one moves towards more exotic regions where no experimental information is available.

We have investigated the sensitivity of reaction models to different nuclear-physics "inputs" (alpha potentials, masses, level densities, etc.). We have also evaluated the uncertainty of the rates by comparing the results obtained using different models to calculate these "inputs". Finally, we have identified the most important (α,n) reactions in the synthesis of elements between Sr and Ag.

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