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Contribution of nuclear reactions in the production of heavy elements: Analysis in a supernovae environment

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The production of neutron-rich heavy elements takes place via the rapid neutron capture process (r-process). To favour neutron captures over beta decays the astrophysical environment should be explosive like the one found in the core-collapse supernovae. In this work, we focus on the High Entropy Winds (HEW) in Type II supernovae which are one of the more promising sites for the r-process. After the neutron capture rates decrease, due to drop in the neutron density, the remaining nuclides can be highly unstable. After considerable time, these nuclei will decay to stability. The final abundances of elements will depend, besides of neutron capture, on other processes such as beta decay, alpha decay, photo dissociation, alpha capture and beta-delayed neutron emission. The present work evaluates the contribution that these processes have to the final abundances of certain nuclides and studies the dependence of that contribution in the presence of each one of the other processes. For our nucleosynthesis calculations, we used rJava 2.0, software that is able to simulate the physical environment of HEW as well as other r-process sites as the ejecta of neutron star mergers and the ejecta of quarknova.

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