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Weak rp-process nucleosynthesis in primordial novae explosions

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Classical novae are stellar thermonuclear explosions involving a white dwarf accreting material from a companion star. Early in the Galactic history, these explosions proceeded differently, mainly due to the accretion of sub-solar metallicity material onto the white dwarf. It has been proposed that these primordial nova explosions produce a different abundance pattern compared to their classical counterparts. In particular, the nuclear flows extend up to the Cu-Zn region resembling a weak *rp*-process, compared to classical novae which have an endpoint around Ca. We studied the nucleosynthesis in that scenario and also the impact of the nuclear physics uncertainties in the final abundance pattern, varying all the relevant reactions in the network within their uncertainty using a Monte Carlo approach. We find nuclear reactions whose uncertainties affect the production of intermediate mass nuclei under primordial-nova conditions. These reactions need to be measured experimentally at stable and radioactive beam facilities to reduce their rate uncertainties. To begin constraining these reactions, recent indirect (3He,d) transfer measurements to extract information for (p,γ) reactions using the Enge split-pole spectrograph at the Triangle Universities Nuclear Laboratory (TUNL) will be discussed.

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