

New mass evaluation and its implication for the neutron-rich nucleosynthesis product yield

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Estimates for experimentally unknown nuclear masses are obtained by a phenomenological approach based on a local mass relation for the residual neutron-proton interaction. The local mass relations method provides both high accuracy of isotope mass predictions and mathematical simplicity of calculations [1, 2]. Results based on different databases AME2012-2020 [3] are presented. Neutron-rich isotopes in the r-process region are considered in detail.

The rates of neutron capture reactions at temperatures of 0.1-10 GK are calculated using the TALYS program [4] with the obtained mass estimates. The resulting rates are compared with calculations based on other mass prediction approaches. The resulting rates are also applied to calculate the r-process products yield in standard scenarios using the SkyNet library [5].

The results presented in this work demonstrate sensitivity of nucleosynthesis calculations to nuclear characteristics and neutron dripline localization.

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