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Nuclear-physics data for modeling of the r-process

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Nucleosynthesis theory predicts that about half of the chemical elements above iron are formed in explosive stellar scenarios by the r-process, i.e. a combination of rapid neutron captures, inverse photodisintegrations, and slower beta-decays, beta-delayed processes, as well as fission and possibly interactions with neutrinos. A correct modelling of this process, therefore, requires the knowledge of nuclear properties very far from stability and a detailed description of the astrophysical environments. With respect to nuclear data, after an initial period of measuring ‘’waiting-point” nuclei with magic neutron numbers, recent investigations have paid special attention to shape transitions and the erosion of classical shell gaps with possible occurrence of new magic numbers. The status of experimental and theoretical nuclear data on masses and beta-decay properties will be briefly reviewed, and consequences on the overall r-process matter flow up to the cosmochronometers Th-232 and U-238 will be discussed.

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