Nuclear isomers in the r-process nucleosynthesis

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The rapid neutron capture process (r-process) is responsible for creating approximately half of the elements heavier than iron. Recent experimental efforts and advances in the modeling of nuclear properties have provided a solid ground to study the r-process nucleosynthesis and the origin of elements. Nevertheless, the role of isomeric states is overlooked.

Typically nucleosynthesis networks use only the ground state rates, or the levels are considered to be in a thermal equilibrium probability distribution. The presence of an isomeric state can diminish the accuracy of both approaches and alter results related to abundances and heating rates. It has been demonstrated that nuclear isomers are dynamically populated in the *r*-process and that some are populated far from thermal equilibrium [1].

The treatment of the isomeric states by nuclear reaction networks is usually limited to postprocessing or the inclusion of the isomeric states in the decay path of a precalculated solar-like abundance pattern [1].

We will present the first approach to implementing nuclear isomers in a nuclear reaction network. Furthermore, we will discuss the impact of the isomeric states on the calculated abundances and heating rates as well as the possible impact on the kilonova light curve.

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