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ABSTRACT

Impact of experimentally constrained nuclear level densities and gamma-ray strength functions for the astrophysical i-process

Andrea Richard

Lawrence Livermore National Laboratory

One of the major areas of research in nuclear astrophysics is understanding the origin of the elements in stellar environments. Observations of carbon-enhanced metal poor stars (CEMP) show that observed abundance patterns cannot be reproduced by the traditional neutron-capture processes (s and r), and indicate that an additional process known as the intermediate neutron-capture process (i-process) is needed to describe these abundances. Occurring at intermediate neutron densities, the majority of nuclear physics properties (mass, half-life, etc.) are well constrained, however statistical quantities and their resulting reaction rates remain largely unmeasured. Using indirect techniques, neutron-capture cross sections and reaction rates for radioactive nuclei can be experimentally determined. In this talk, results on the nuclear level densities, gamma-ray strength functions, and neutron-capture reaction rates relevant to the i-process will be discussed along with astrophysical network calculations showing their impact on predicted abundances.

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