EXPERIMENTAL STUDIES FOR THE ASTROPHYSICAL R PROCESS

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The astrophysical r process is responsible for the synthesis of about half of the isotopes of the heavy elements. Despite its well-known role in nucleosynthesis, the astrophysical site where it takes place has not been unambiguously determined. Efforts to better understand this important process span across many fields, from astronomical observations of metal-poor stars, and modeling of the possible scenarios, to sensitivity studies to input parameters, nuclear theory calculations and nuclear experiments. The present talk will focus on some of the experimental efforts for providing nuclear input information to help improve our understanding of the r-process. One of the important inputs, that is practically unconstrained by experiment, is neutron capture reactions. The direct measurement of neutron-capture reaction rates on short-lived nuclei is at best challenging, and as a result the relevant theoretical models are largely unconstrained. Indirect experimental approaches are required and this talk will present the development of a new technique to experimentally constrain these important (n,γ) reaction rates. In addition, new measurements of the β-decay intensity and comparison to theoretical calculations will be presented. The relevant experiments were done at the National Superconducting Cyclotron Laboratory (NSCL) at Michigan State University using the γ-calorimeter SuN. New results in the mass region of A=70 will be presented.