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Constraining the ^{69}Zn Neutron Capture Cross-Section via the Beta-Oslo Method

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The existence of the weak intermediate neutron-capture process (i-process) explains the observed astrophysical abundances of elements around the $Z < 50$ region. Neutron capture reactions in the $A = 70$ mass region for Ni, Cu, and Zn isotopes are known to produce large variations in predicted i-process abundances. Predicted stellar abundances of Ga are particularly affected by the $^{69}\mathrm{Zn}(\mathrm{n},\gamma)^{70}\mathrm{Zn}$ reaction. The β-decay of ^{70}Cu offers an unique opportunity to utilize the β-Oslo method to experimentally determine the γ-ray strength function and nuclear level density and constrain the $^{69}\mathrm{Zn}(\mathrm{n},\gamma)^{70}\mathrm{Zn}$ reaction rate for i-process nucleosynthesis. ^{70}Cu has three different β-decaying spin-parity states that populate different spin ranges at similar excitation energies in the daughter nucleus: the 6^- ground state, the $101\,\mathrm{keV}$ 3^- isomeric state, and the $242\,\mathrm{keV}$ 1^+ isomeric state. In experiments performed at the NSCL and FRIB, the isomers and ground state of ^{70}Cu were produced and delivered to the Low Energy Beam and Ion Trap (LEBIT) and then to Summing NaI (SuN) Total Absorption Spectrometer. Preliminary results from β-Oslo analysis will be presented along with the preliminary constrained $^{69}\mathrm{Zn}(\mathrm{n},\gamma)^{70}\mathrm{Zn}$ cross-section. Initial results from the commissioning of the SuN upgrade (to SuN++) will also be presented.

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