Impact of electron-captures on nuclei near $N = 50$ on core-collapse supernovae

R. Titus[a,b,c], C. Sullivan[a,b,c], R. G. T. Zegers[a,b,c], B. A. Brown[a,b,c], B. Gao[a,c]

[a] *National Superconducting Cyclotron Laboratory, Michigan State University,* [b] *Department of Physics and Astronomy, Michigan State University,* [c] *Joint Institute for Nuclear Astrophysics: Center for the Evolution of the Elements, Michigan State University*

Sensitivity studies of the late stages of stellar core collapse with respect to electron-capture rates indicate the importance of a region of nuclei near the $N = 50$ shell closure, just above doubly magic ^{78}Ni. In the present work, it has been demonstrated that uncertainties in key characteristics of the evolution, such as the lepton fraction, electron fraction, entropy, stellar density, and in-fall velocity are about 50% due to uncertainties in the electron-capture rates on nuclei in this region, although thousands of nuclei are included in the simulations. The present electron-capture rate estimates used for the nuclei in this region of interest are primarily based on a simple approximation, and it is shown that the estimated rates are likely overestimated by an order of magnitude or more. More accurate microscopic theoretical models are required to obtain Gamow-Teller strength distributions, upon which electron-capture rates are based. The development of these models and the benchmarking of such calculations rely on data from charge-exchange experiments at intermediate energies. An experimental campaign to study Gamow-Teller strength distributions in nuclei at and near $N = 50$, including ^{86}Kr and ^{88}Sr, with the (t,^{3}He) reaction at NSCL is underway and preliminary results, and their effects on future astrophysical work, will be presented.