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Investigating and reducing the impact of nuclear reaction rate uncertainties on ^{44}Ti production in core-collapse supernovae

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Recent observational advances have enabled high resolution mapping of ^{44}Ti in core-collapse supernova (CCSN) remnants. Comparisons between observations and 3D models provide stringent constraints on the CCSN mechanism. However, recent work has identified several uncertain nuclear reaction rates that influence ^{44}Ti production in model calculations. We use MESA (Modules for Experiments in Stellar Astrophysics) as a tool to investigate the previously identified sensitivities of ^{44}Ti production in CCSN to varied reaction rates. MESA is a code for modeling stellar evolution and stellar explosions in one-dimension. We will present the preliminary simulation and sensitivity study results, and our plans to reduce or remove the most significant uncertainties from (α, n), (α, p), (α, γ), (p, n) and (p, γ) reaction rates using direct and indirect measurement techniques at the Edwards Accelerator Lab at Ohio University.

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