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Simulation of Statistical Neutron Capture Processes Using Monte Carlo Methods with TALYS DREW D. DYCUS, Tenn. Tech. Univ., MICHAEL BERTOLLI, MICHAEL S. SMITH, ORNL, RAYMOND L. KOZUB, Tenn. Tech. Univ. — The rapid neutron capture process (r-process) is thought to be responsible for the synthesis of about half of the nuclear species heavier than Fe. Calculations for the r-process suggest the ^{130}Sn$(n,\gamma)^{131}$Sn reaction rate plays a pivotal role in nucleosynthesis, engendering global effects on isotopic abundances over a wide mass range during the freeze-out epoch following $(n,\gamma) \rightleftharpoons (\gamma,n)$ equilibrium. This is owing, in part, to the long β-decay lifetime of ^{130}Sn (162 s). Direct neutron capture (DC) is likely the dominant reaction at late times in the r-process near the N=82 closed shell, but the reaction rate and nucleosynthesis calculations require (n,γ) cross sections for both DC and statistical capture. The latter depend heavily on the level density, and that is not yet well established for ^{131}Sn. In order to acquire better estimates of the statistical contribution in the doubly magic ^{132}Sn region, we have undertaken Monte Carlo methods of varying the nuclear reaction model parameters to calculate (n,γ) cross sections for a range of incident neutron energies using the code TALYS. Results will be presented. Research supported by the U. S. Department of Energy.

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