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Systematic study of alpha-optical potential near the Z=50 region for p-process[1] WANPENG TAN, A. PALUMBO, A. BEST, M. COUDER, J. DEBOER, S. FALAHAT, J. GÖRRES, P. LEBLANC, H. LEE, S. O'BRIEN, E. STRANDBERG, M. WIESCHER, University of Notre Dame, J. GREENE, Argonne National Laboratory, ZS. FÜLÖP, GY. GYÜRKY, G. KISS, E. SOMORJAI, ATOMKI, Hungary, G. EFE, R. GÜRAY, N. ÖZKAN, Kocaeli University, Turkey
— Production of proton-rich elements beyond iron in stars proceeds via p-process, i.e., a sequence of photo-disintegration reactions, (γ,n), (γ,p), and (γ,α) on heavy elements at temperatures of 2-3 x 10^9 K. The involved reaction rates are typically calculated with the statistical Hauser-Feshbach (HF) model. However, the HF model performs poorly in calculating the critical (γ,α) rates due to the uncertainty of the alpha optical potentials applied. To test the reliability of the HF calculations and provide a systematic understanding of the alpha optical potential at energies of astrophysical interest, a series of precision alpha scattering measurements were carried out at the Notre Dame FN tandem accelerator. Specifically, ^{106}Cd, ^{118}Sn, and ^{120,124,126,128,130}Te were studied at energies both below and above the Coulomb barrier. The derived potential was applied for calculating the α-induced reaction rates on these nuclei using the CIGAR code. The results were compared to the corresponding experimental rates obtained via activation experiments at Notre Dame and other places.

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