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Electromagnetic Properties of the 106Cd Nucleus and Experimental Validation of the Generalized Brink-Axel Hypothesis (gBA)

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This study extracts new experimental γ-ray strength function (γSF) and nuclear level density (NLD) data for the ¹⁰⁶Cd isotope using the newly developed Shape Method, coupled with the Oslo Method. These methods are applied to particle-γ coincidence data from the ¹⁰⁶Cd(³He, ³He'γ)¹⁰⁶Cd reaction at the Cyclotron Laboratory of Oslo University (OCL). The functional forms of the γSF and NLD have been normalized using the Shape Method, which enables the extraction of γSF and NLD data even in the absence of experimental neutron resonance spacing. This experimental data is then used to calculate the ¹⁰⁶Cd(n, γ) cross-sections within the Hauser-Feshbach formalism. Moreover, this study experimentally tests the validity of the generalized Brink-Axel hypothesis (gBA) in the mass region A=106 for the first time, which asserts that the γ-ray strength function (γSF) is independent of excitation energy. Additionally, we extend our investigation to ¹⁴⁰La, where the validity of the gBA is tested experimentally using data from the ¹³⁹La(d,p) reaction, also conducted at OCL. Finally, the thermodynamic properties of ¹⁰⁶Cd nucleus are extracted for the first time. Details of our findings will be presented at the upcoming conference.

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