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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 (γ SF) and nuclear level density (NLD) data for the $\langle \sup \rangle 106 \langle \sup \rangle Cd$ isotope using the newly developed Shape Method, coupled with the Oslo Method. These methods are applied to particle- γ coincidence data from the $\langle \sup \rangle 106 \langle \sup \rangle Cd(\langle \sup \rangle 3 \langle \sup \rangle He, \langle \sup \rangle 3 \langle \sup \rangle He' \gamma) \langle \sup \rangle 106 \langle \sup \rangle Cd$ reaction at the Cyclotron Laboratory of Oslo University (OCL). The functional forms of the γ SF and NLD have been normalized using the Shape Method, which enables the extraction of γ SF and NLD data even in the absence of experimental neutron resonance spacing. This experimental data is then used to calculate the $\langle \sup \rangle 106 \langle \sup \rangle Cd(n, \gamma)$ 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 (γ SF) is independent of excitation energy. Additionally, we extend our investigation to $\langle \sup \rangle 140 \langle \sup \rangle La$, where the validity of the gBA is tested experimentally using data from the $\langle \sup \rangle 139 \langle \sup \rangle La(d,p)$ reaction, also conducted at OCL. Finally, the thermodynamic properties of $\langle \sup \rangle 106 \langle \sup \rangle Cd$ nucleus are extracted for the first time. Details of our findings will be presented at the upcoming conference.

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