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Exploration of Direct Neutron Capture with Covariant Density Functional Theory Inputs

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Predictions of direct neutron capture are of vital importance for simulations of nucleosynthesis in supernovae, merging neutron stars, and other astrophysical environments.
We calculated direct capture cross sections using nuclear structure information obtained from a covariant density functional theory as input for the FRESCO coupled reaction channels code.
We investigated the impact of pairing, spectroscopic factors, and optical potentials on our results to determine a robust method to calculate cross sections of direct neutron capture on exotic nuclei.
Our predictions agree reasonably well with experimental cross section data for the closed shell nuclei O-16 and Ca-48, and for the exotic nucleus S-36.
We then used this approach to calculate the direct neutron capture cross section on the doubly magic unstable nucleus Sn-132 which is of interest for the astrophysical r-process.

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