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Indirect measurement of the $(n,\gamma)^{127}$Sb cross section \\ from experimental level density and γ-strength function

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Nuclei in the ^{135}I region have been identified as a possible bottleneck for the i process. Nuclear properties such as the Maxwellian-averaged cross section are indispensable tools when trying to explain nucleosynthetic processes, but the instability of the region prevents us from carrying out direct measurements. In order to investigate it, we propose an indirect approach.

At the Oslo Cyclotron Laboratory we carried out the ^{124}Sn$(\alpha, p\gamma)^{127}$Sb reaction in order to extract the nuclear level density and the γ ray strength function of ^{127}Sb using the Oslo method, with the aim of calculating the Maxwellian-averaged cross section and the neutron-capture rate of the A-1 nucleus ^{126}Sb.

The level density in the low excitation-energy region agrees well with known discrete levels, and the higher excitation-energy region follows an exponential curve compatible with the constant temperature model.
The strength function between $E_\gamma \approx$ 1.5-8.0 MeV presents several features, such as an upbend and a possibly double-peaked pygmy-like structure.
None of the theoretical models included in the nuclear reaction code TALYS seem to reproduce well the experimental data.

The Maxwellian-averaged cross section for the ^{126}Sb$(n,\gamma)^{127}$Sb reaction has been experimentally constrained by using our level-density and strength-function data as input to TALYS.
The results show good agreement with the JINA REACLIB, TENDL and BRUSLIB libraries, while the ENDF/B-VIII.0 library predicts a significantly larger cross section.

Field of work

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