CONSTRAINTS ON THE ^{7}Be(p,γ)^{8}B RADIATIVE CAPTURE*

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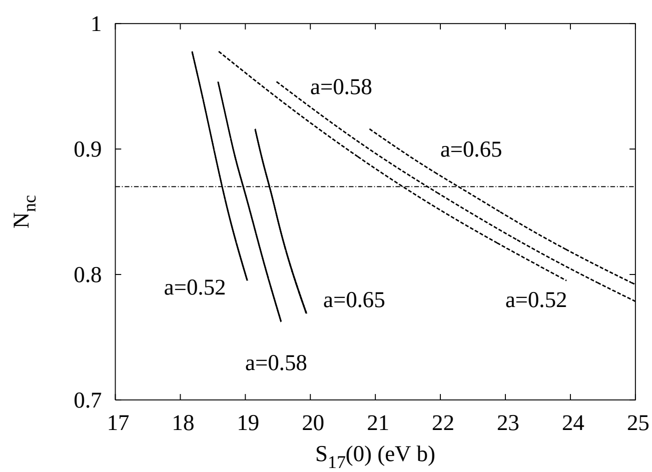
A large effort has gone into determining the S factor for the radiative proton capture on ^{7}Be at low energy. Unfortunately, the overlap between the different experimental results is somewhat marginal in several cases. It is therefore of interest to investigate what other methods can be used to put constraints on the low-energy S factor.

One way is to use the experimental information about the mirror reaction ^{7}Li(n,γ)^{8}Li and use charge symmetry to predict the S factor for ^{8}B. I have used a simple two-body model of ^{8}Li and ^{8}B, both described as a valence nucleon interacting with an A=7 core, and used a Woods-Saxon parametrization of the nuclear interaction. The depth of the potential is adjusted for each reaction channel so that binding energies and s-wave scattering lengths are reproduced.

The calculations have been repeated for a wide range of the radius R and the diffuseness a of the nuclear interaction. For each parameter set *(R,a)* the normalization factor N_{nc} that is required to reproduce the low-energy neutron capture data on ^{7}Li has been extracted, and in a separate calculation the S factor for the radiative proton on ^{7}Be at zero energy, $S_{17}(0)$, has been obtained. The correlation between these two quantities is shown in the figure by dashed curves for three choices of the diffuseness of the interaction. One can interpret N_{nc} as an effective spectroscopic factor. Assuming charge symmetry, one can then predict an effective S factor: $S_{17}^{eff}(0) = N_{nc} \times S_{17}(0)$. This quantity and its correlation with N_{nc} is shown in the figure by the solid curves. It is seen that the range of the predicted S factor is rather limited. Assuming a spectroscopic factor of 0.87 (the horizontal line) one obtains the estimate: $S_{17}^{eff}(0) \approx 19 \pm 0.5$ eV b. Uncertainties in this model-dependent estimate will be discussed. I will also explain why similar potential model calculations, which have been based on input from the shell model, have not been able to reproduce the low energy ^{8}Li and ^{8}B capture data simultaneously, when using the same parameter set (R,a) for the potential.



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