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^{3}He(α,γ)^{7}Be cross section measurements at high energy

Abstract

The $^3He(α,γ)^7Be$ reaction is the starting point of the ppII and ppIII reaction branches in the solar hydrogen burning, therefore its rate has sizeable impact on the solar ^7Be and ^8B neutrino production. It has also considerable impact on the production of ^7Li in the big bang nucleosynthesis (BBN).

Many experiments have been done since the turn of the century clearing up some long standing issues regarding the $^3He(α,γ)^7Be$ reaction [1,2], but this reaction rate is still one of the most uncertain solar rates. Most of the reaction cross section measurements concentrated on the low energies and their precision mostly reached the limits. However, there is no experimental data above E_{cm} = 3.1 MeV. It was suggested recently, that the R-matrix models have to be tested with higher energy datasets [3]. In addition, there are conflicting datasets for the $^6Li(p,γ)^7Be$ reaction [4,5] having impact on the level scheme of ^7Be.

We measured the $^3He(α,γ)^7Be$ reaction cross section with the activation technique in a wide energy range between E_{cm} = 2.5-4.4 MeV. The lower part of the investigated energy range contains data points from previous measurements [9] to have a possible direct comparisons with other works. The higher part extends above the proton separation energy of ^7Be, thus it can be compared also with the $^6Li(p,γ)^7Be$ reaction cross sections.

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