STUDY OF n+25Mg REACTIONS: TOWARDS A DEEPER UNDERSTANDING OF THE s PROCESS

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The s process is responsible for the production of about half of the elemental abundances beyond iron that we observe today. The s-process isotopes are produced either in massive stars, where the ^{22}Ne(α, n)^{25}Mg reaction is the main neutron source, or in low mass Asymptotic Giant Branch stars, where the neutrons are provided by the ^{13}C(α, n)^{16}O and the ^{22}Ne(α, n)^{25}Mg reaction.

In stars with an initial metal content similar to solar, ^{25}Mg is the most important neutron poison via neutron capture, in competition with ^{56}Fe.

In addition the study of n+^{25}Mg reactions gives important constraints for the yet uncertain reaction rate of the important neutron source ^{22}Ne(α, n)^{25}Mg. The relevant information in this respect is the spin and parity of the neutron resonances formed in the (n, α) reaction. This information can be deduced from the resonance analysis of neutron capture and total cross section data and ii) the study of de-excitation path and primary γ-ray transitions in the ^{26}Mg compound nucleus.

Taking advantage of the complementary features of the neutron time-of-flight facility n_TOF at CERN, and GELINA at EC-JRC-IRMM, capture and total cross section measurements have been performed on this isotope. Moreover the γ spectrum was measured by means of Germanium detectors.

The studies here presented are providing new data with the required accuracy for a substantial improvement in the understanding of the relevant astrophysical processes.