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Experimental Study of the 30Si(p,γ)31P via the 30Si(3He,d)31P transfer reaction for understanding elemental anomalies in Globular Clusters.

Globular clusters are key grounds for models of stellar evolution and early stages of the formation of galaxies. Abundance anomalies observed in the globular cluster NGC 2419, such as the enhancement of potassium and depletion of magnesium can be explained in terms of an earlier generation of stars polluting the presently observed stars. However, the nature and the properties of the polluting sites are still debated. The range of temperatures and densities of the polluting sites depends on the strength of a number of critical thermonuclear reaction rates. The 30 Si(p,γ) 31 P reaction is one of the few reactions that have been identified to have an influence for elucidating the nature of polluting sites in NGC 2419. The current uncertainty on the 30 Si(p,γ) 31 P reaction rate has strong impact on the range of possible temperatures and densities of the polluter sites. Hence, we investigated the 30 Si(p,γ) 31 P reaction with the aim to reduce the associated uncertainties by determining the strength of resonances of astrophysical interest. In this talk I will present the study of the reaction 30 Si(p,γ) 31 P that we performed via the one proton 30 Si(3 He,d) 31 P transfer reaction at the Maier-Leinbnitz-Laboratorium Tandem. With the high resolution Q3D magnetic spectrograph, we measured the angular distributions of the light reaction products. These angular distributions are interpreted in the DWBA (Distorted Wave
Born Approximation) framework to determine the proton spectroscopic factor information needed to determine the proton partial width of the states of interest. This information was used to calculate the 30 Si(p,γ) 31 P reaction rate. The uncertainties on the reaction rate have been significantly reduced and key remaining uncertainties have been identified.

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