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Measurement of 21Na(α,p)24Mg cross section for the study of 44Ti production in supernovae.

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While core collapse supernovae have long captured the attention of physicists and astronomers, surprisingly little is currently known about the nature of the explosion mechanism. This is due to the complexity of the explosion, the large computational requirements for even 2D simulations, and the lack of precise nuclear physics inputs to these models. One of the few methods by which this explosion mechanism might be studied is through a comparison of the amount of 44Ti observed by space based γ-ray telescopes and the amount predicted to have been generated during the explosion. For these comparisons between observations and models to be made, however, more precise nuclear physics inputs are required. The reaction 21Na(α,p)24Mg has been identified as one of the key reactions affecting the 44Ti mass fraction by factors of 10 or more. There are currently no published data on this reaction.

A direct experimental measurement of the 21Na(α,p)24Mg cross section has been carried out at TRIUMF, Canada. This experiment utilised the TUDA facility at ISAC-I. The 21Na radioactive beam, at high intensity, impinged on a 2cm wide gas target, containing 100 torr of 4He. A downstream silicon array, consisting of a dE-E telescope,
detected the reaction protons. An upstream silicon array measured beam back-scattered from a Au foil located at the entrance of the gas target, for normalisation. Data were collected at four laboratory energies covering Ecm=3.2-2.5 MeV, which is approximately the top half of the 2GK Gamow Window. Preliminary analysis results will be presented, along with details of the experimental challenges encountered and the steps taken to overcome them.

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