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Constraining the Neutron Capture Rate for 90Sr through β-Decay into the Short-Lived 91Sr Nucleus

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The slow (s) and rapid (r) neutron capture processes have long been considered to produce nearly the entirety of elements above Fe, but when comparing their yields with spectroscopic data, inconsistencies in abundance arise in the Z=40 region. These differences are expected to be attributable to the intermediate (i) neutron capture process.

Working in weak i-process neutron densities on the order of 10^{13} neutrons/cm^3, the ^{90}Sr(n,γ)^{91}Sr capture reaction has a negative correlation to the production of Zr, possibly explaining the discrepancy between the observed and predicted elemental abundances of Zr in i-process environments such as CEMP-i stars.

I will discuss the β-Oslo analysis of ^{91}Sr to reduce uncertainties in the ^{90}Sr(n,γ)^{91}Sr reaction, measured via the β-decay of ^{91}Rb into ^{91}Sr with the SuN total absorption spectrometer at the NSCL in 2018. By measuring both γ-ray and excitation energies, a coincidence matrix was produced to perform the Oslo analysis, providing experimental information on the Nuclear Level Density (NLD) and γ-ray Strength Functions (γSF), two critical components in limiting the uncertainty of the neutron capture cross section when it cannot be directly measured. This constrained uncertainty will allow us to better characterize the contribution of ^{90}Sr to the i process and make progress in explaining observed abundances in suspected i-process stellar environments.

Your Email

bgreaves@uoguelph.ca

Supervisor

Carl E. Svensson

Supervisor Email

sven@uoguelph.ca

Affiliation

University of Guelph

Your current academic level,

PhD student

Primary author: GREAVES, Beau (University of Guelph)

Presenter: GREAVES, Beau (University of Guelph)

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