Contribution ID: **24** Type: **Oral presentation**

Constraining the i Process Elemental Abundances through Indirect Neutron Capture Rate Measurements of ^{90}Sr and ^{140}Cs with SuN

Friday 31 May 2024 14:50 (20 minutes)

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.

Increases in the ^{90}Sr(n,γ)^{91}Sr and ^{140}Cs(n,γ)^{141}Cs capture cross sections have been shown to decrease simulated abundances of Zr and Ce respectively, with neither having previously experimentally measured reaction rates. Constraining the uncertainties on these reactions will provide information to explain the discrepancies between the observed and predicted elemental abundances of Zr and Ce in i-process environments such as CEMP-i stars.

The completed β-Oslo analysis of ^{91}Sr to reduce uncertainties in the ^{90}Sr(n,γ)^{91}Sr reaction will be presented, 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.

In addition, the first preliminary results of the β-Oslo analysis of ^{141}Cs will be discussed, investigating the neutron capture rate of ^{140}Cs, completed with SuN at ANL in 2021.

These constrained uncertainties will allow us to better characterize the contribution of ^{90}Sr and ^{140}Cs to the i process and progress in explaining observed abundances in suspected i-process stellar environments.

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