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The Exploration of the Indirect Neutron-Capture Constraints of the 87,89Kr(n,γ)88,90Kr reactions in the Astrophysical i-process using the β-Oslo Method

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One of the main questions that is of critical interest in nuclear astrophysics is how elements are produced in stars. The traditional nuclear landscape shows that elements are created through the slow (s), rapid (r) and proton (p) processes. Recently, astronomical observations of Carbon-Enhanced Metal Poor (CEMP) stars have shown "strange"abundance patterns, which cannot be explained by the s- and the r-processes alone. This observation indicates that an additional nucleosynthesis process is required to explain CEMP abundances, being the astrophysical intermediate (i-) neutron-capture process. The i-process occurs from 2-8 mass units away from the valley of stability. Nuclear properties needed to predict elemental abundances following the i process are relatively well constrained with the exception of neutron-capture reaction rates, which are entirely provided by theory. Recent sensitivity studies have shown that the Rb/Sr abundances are strongly affected as a result of neutron-capture reactions on Kr isotopes. In this talk, the first experimental constraint of the ^{87,89}Kr(n,γ)^{88,90}Kr reactions will be discussed utilizing the β-Oslo method. This experiment took place using the CARIBU facility at Argonne National Laboratory by exploiting the indirect method of β-decays from the ^{88,90}Br nuclei into ^{88,90}Kr. Subsequent γ-rays were identified by using the Summing NaI detector, SuN, and the SuNTAN tape transport system. By utilizing the statistical properties of both ^{88,90}Kr, the ^{87,89}Kr(n,γ)^{88,90}Kr experimentally constrained cross sections have been extracted and their impact on the astrophysical i-process will be discussed.

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