CONVERSION COEFFICIENT MEASUREMENTS OF ^{176}LU USING ICEBALL

Abstract

by

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We have studied the multipolarites of several transitions in the nucleus ^{176}Lu. The synthesis of ^{176}Lu in stellar environments is through the slow (s-) neutron capture process. The s-process is responsible for the creation of 50% of the heavy elements and 15-20 nuclei in the s-process are s-process branching points. Branching points determine if the synthesis path will β-decay or neutron capture. The branching point ^{176}Lu is only produced via the s-process only and has both a long-lived ground state ($K = 7^-$) of 37.6 GYrs and a short-lived isomeric state ($K = 0^-$) at 3.6 hrs. There is no direct decay to both the isomer and ground state due to selection rules. However, an intermediate state was found at 839 keV ($K = 4^+$) that communicates to both the isomer and ground state. The $K = 4^+$ band can communicate to both the isomer and ground state and the intermediate states affects the final abundances of ^{176}Lu in stellar environments which is sensitive to temperature. The experiment was performed at the University of Notre Dame Nuclear Science Laboratory (NSL) using a ^{176}Yb(p, n) reaction at 7.75 MeV. Gamma-gamma and gamma-electron coincidences were measured for conversion coefficients using the Internal Conversion Electron Ball (ICEBall) array and two HPGe detectors (109% relative efficiency at 1332 keV to NaI). ICEBall was upgraded at the NSL for an improved efficiency from 6%-15% over 4π. A total of 40 conversion coefficients were measured and 35 multipolarities were assigned. 17 new conversion coefficients were measured and the corresponding

multipolarities were assigned. Cascades in the $K = 4^+$ band were measured in which new multipolarities were assigned.