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Study of ⍰-decay and ⍰-delayed proton emission in neutron deficient isotopes of Cd and In (Z = 48, 49)

Abstract: In this Letter of Intent we would like to study the beta-decay and beta-delayed proton emission in Cd(Z = 48, N = 49,50,51) and In(Z = 49, N = 52,53) isotopes. The measurements include the decay gamma rays by both high resolution spectroscopy (HRS) and total absorption spectroscopy (TAS). With these measurements, the properties of the excited states in the daughter and the beta-feeding intensities will be established. We will also determine the branching ratio of the beta-delayed proton emission, whereever applicable. In the long run, the halflife measurement of the excited daughter states will also be attempted by fast timing technique by taking advantage of the use of LaBr3:Ce detectors. These measurements will provide crucial information on the shell structure for the neutron-deficient nuclei around the doubly magic 100Sn and will provide useful inputs to the astrophysical process for the production and abundance of proton-rich nuclei, in particular above the 96Cd waiting point nucleus. This proposed study encompasses both sides of the N = 50 shell closure to get a comprehensive picture of the decay modes around neutron shell closure close to 100 Sn. The produced nuclei (using, parimarily, heavy-ion induced fusion evaporation reaction), following Z and A separation, will be implanted on a magnetic tape and transported to the decay station composed of a powerful spectrometer developed by (NA) 2 STARS collaboration. This detection system include a combined TAS array consisting of LaBr3(Ce), NaI(Tl) and BaF2 detectors. This will also include a few HPGe detectors and beta detector to facilitate the HRS measurement, X-ray measurement and charged particle detection.

The goal of the experiment will be fully achieved through a series of measurements with increasing complexity in terms of nucleus being studied and the detection system being used.

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