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Fabrication of thin sandwiched 142,150Nd targets

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The synthesis of heavier elements is one of the prime area of research in experimental and theoretical nuclear physics experiments. Using 48Ti as a projectile, we have planned to carry out the study of ER cross-section and spin distribution of ERs on isotopic 142,150Nd lanthanide targets using HYRA spectrometer [1]. Fabrication of thin self supporting targets is highly difficult. But, due to oxidizing and smearing nature of lanthanides it is very difficult to get a self-supporting very thin target foil (specially for high Z materials). In the trial session, various attempts were made to prepare thin self-supporting Nd targets but all the trials were unsuccessful. So, we have decided to use a very thin backing foil of light Z material to fabricate 142,150Nd targets for the reaction studies. Furthermore, due to the hygroscopic nature of Nd, it quickly reacts with the hot water and form Nd(OH)3. To avoid the direct contact between Nd layer and water during floating, a very thin coating of carbon (thickness ~10 μg/cm2) was also deposited [2] just after the deposition of Nd layer. Prior to this work, some groups have also reported the preparation of Nd targets, Sugai et al. [3] prepared 142Nd targets of thickness 100 mg/cm2 by fluorination of rare-earth oxide powders followed by a Ca reduction using RF heating, Greene et al. [4] used zirconium as the reducing agent and neodymium targets of thickness 0.5 and 1.2 mg/cm2 has been prepared on 500 μg/cm2 carbon backing. In the present work, the fabrication of sandwiched 142,150Nd targets of thickness ~100-150 μg/cm2 were fabricated between two very thin layers of carbon using thermal evaporation method in diffusion pump based HV chamber which were used for the HYRA spectrometer experiments.

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