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Production of 236gNp and 236Pu in proton induced nuclear reactions on natU

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Radiochemical analysis of 237Np is important in a number of fields, such as nuclear forensics, environmental analysis and measurements throughout the nuclear fuel cycle. However analysis is complicated by the lack of a stable isotope of neptunium. Although various tracers have been used, including 235Np, 239Np and even 236Pu, none are entirely satisfactory. However, 236gNp would be a better candidate for a neptunium yield tracer, as its long half-life means that it is useable as both a radiometric and mass spectrometric measurements. 236Pu is a valuable radionuclide itseld and has been routinely used as a yield tracer for analysis of plutonium in environmental and technological samples.
Current study investigates the feasibility of 236Np and 236Pu production by (p,3n) reaction on natural uranium. The targets–either metallic uranium, U3O8 or uranyl nitrate–were prepared by compaction into copper or aluminium substrates, with a thin aluminium or titanium cover foil and irradiated with 25 MeV protons on the cyclotron at the University of Birmingham. Targets were cooled for 20 days to allow the short lived fission products to decay away and than chemically processed to separate Np and Pu fraction by solvent extraction, ion-exchange and extraction chromatography. The neptunium and plutonium fractions were assayed by γ- and α-spectrometry and the production yields were determined and discussed.

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