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Nuclear excitation function for medical relevant radionuclieds; natZr(d,x)86Y

The aim of this work is to measure the nuclear excitation functions for natZr(d,x) reactions for a better characterization of their experimental cross sections. In particular, the possible production pathway for the medical relevant radionuclide 86Y was in focus. 86Y is a positron emitter and can be used in PET-scan and theranostics together with 90Y.

The experiment was conducted at the Lawrence Berkeley National Laboratory (LBNL) in February 2017, and consisted of irradiation of two stacks of targets. The first stack consisted of five compartments of natural nickel, titanium and zirconium targets and was irradiated with 30 MeV deuterons. The second stack consisted five compartment of natural titanium, iron and zirconium targets and was irradiated with 50 MeV deuterons. The zirconium foils are the foils of interest and the other foils are used as monitor foils, giving a more precise measurement of the beam current and deuteron energy in the different compartments. Since the deuteron energy is degraded as the beam penetrates the stack, we are able to measure the cross section for the reaction channels as a function of deuteron energy. Gamma-ray spectroscopy using high purity germanium detectors has been used to characterise the activities produced in the foils after irradiation. By fitting decay curves to the measured activity-points, the end of beam activity or production rate has been determined. This is then used to calculate the cross section for a given reaction for a given deuteron energy.

Author: MARTINSEN, Elise Malmer (Univeristy of Oslo)

Presenter: MARTINSEN, Elise Malmer (Univeristy of Oslo)

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