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Nuclear excitation functions for natZr(d,x) reactions with focus on the PET/theranostic candidate 86Y

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Radionuclides are important both for diagnostic and treatment of cancer. 86Y is a candidate for positron emission tomography (PET) and, when employed together with 90Y, is amenable for thernostics. Theranostics can be done using either a self-theranostic nuclide, where the same radionuclide is used in both diagnosis and treatment, or by using two different radionuclides (a theranostic pair), such as 86Y and 90Y, with the same chemical properties, attached to the same searching molecule. In this work, nuclear excitation functions for natZr(d,x) reactions have been measured to investigate if this is a viable pathway to produce the medically relevant 86Y radionuclide. The stacked target activation method1 has been used to analyze two stacked target experiments where natural zirconium foils were irradiated with deuteron beams with incident energies of 30 MeV and 50 MeV. These experiments were conducted at the Lawrence Berkeley National Laboratory (LBNL), and gamma-ray spectroscopy was used to measure the activity of each observed radionuclide in the zirconium foils. The monitor reactions of natFe(d,x)56Co, natNi(d,x)56Co, natNi(d,x)58Co, natNi(d,x)61Cu, natTi(d,x)46Sc amd natTi(d,x)48V have well characterized cross sections and were used to determine the deuteron beam current in each foil, which was required for the cross-section calculations. In this talk I will present the final cross sections and compare them with results from the reaction modelling codes TALYS2, ALICE3, CoH4, EMPIRE5 and TENDL6.

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