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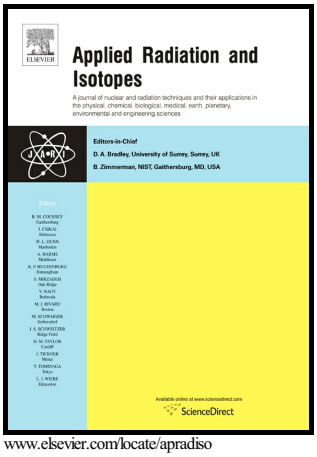

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Modeling and experimental data of zirconium-89 production yield

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Abstract

The radionuclide zirconium-89 can be employed for the positron emission tomography (PET). In this study ^{89}Zr excitation function via ^{89}Y(p,n)^{89}Zr reaction was calculated by the TALYS-1.8 code based on microscopic level density model. The formation of ^{89}Zr was simulated using the Monte Carlo simulation code MCNPX to calculate the integral yield in the ^{89}Y target body for threshold up to 40 MeV incident-proton energy. The target thickness was based on calculation of the stopping power using the SRIM-2013 code matched to any incident-proton energy. The production yield of the ^{89}Zr simulated with the Monte Carlo method for the ^{89}Y(p,n)^{89}Zr, ^{89}Y(d,2n)^{89}Zr, ^{nat}Sr(α,xn)^{89}Zr and ^{nat}Zr(p,pxn)^{89}Zr reactions and the results were in good agreement with published experimental results for the optimum energy range. An experimental yield of 53.1 MB/μA for the 15 MeV proton-induced on Y_2O_3 powder as a disk-target obtained for 1 hour irradiation at the AMIRS cyclotron.