Excitation functions of neutron-induced reactions of medical isotopes ^{32}P, ^{55}Fe, ^{74}As, ^{97}Ru, ^{103}Ru and ^{109}Pd

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Abstract

There are many stable and radioactive isotopes, each having their own physical and chemical properties, perform important roles in technology and actually existing in the field of research. The most common application is the use of radioisotopes in the medicine. The medical radioisotopes are classified as therapeutic and diagnostic radioisotopes, depending on the decaying properties [1]. The diagnostic radioisotopes, depending on the nature of radioisotopes, are used in two types of emission tomography i.e. Single photon emission computed tomography (SPECT) and Positron emission tomography (PET).

The knowledge of the excitation function is necessary, to get a governed and optimized medical radionuclide. In this regard, the theoretical model calculation is very helpful. TALYS-1.9 [2] and EMPIRE-3.2 [3] are used to determine the excitation functions of radionuclides ^{32}P, ^{55}Fe, ^{74}As, ^{97}Ru, ^{103}Ru and ^{109}Pd produced via ^{31}P(n,g)^{32}P, ^{32}S(n,p)^{32}P, ^{56}Fe(n,2n)^{55}Fe, ^{58}Ni(n,α)^{55}Fe, ^{74}Se(n,p)^{74}As, ^{96}Ru(n,g)^{97}Ru, ^{98}Ru(n,2n)^{97}Ru, ^{102}Ru(n,g)^{103}Ru, ^{103}Rh(n,p)^{103}Ru, ^{104}Ru(n,2n)^{103}Ru, ^{108}Pd(n,g)^{109}Pd, ^{109}Ag(n,p)^{109}Pd, ^{110}Pd(n,2n)^{109}Pd, and ^{112}Cd(n,α)^{109}Pd reactions in the neutron energy range 1-20 MeV. The calculated results are discussed and compared with the existing experimental data (EXFOR database) [4] as well as with the evaluated data. The excitation functions of ^{32}P, ^{55}Fe, ^{74}As, ^{97}Ru, ^{103}Ru and ^{109}Pd are medically important and widely used in bone disease treatment, heat source, in biomedical, monoclonal antibodies labelling, imaging, radio labelling and potential radio therapeutic agent.

References

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