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Evaluation of optical potential for (n,2n) cross section reactions and yields for spherical zirconium isotopes

Authors: Iman Tarik Al- Alawy, Khalid A. Ahamed and Waleed Jabbar Mhana
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Abstract :

The development of controlled fusion technique becomes very important. For this reason, the accuracy of the cross section data is important for the prediction of reactor parameters such as the calculation of the activation in materials to be used in fusion reactor. The evaluation is based mainly on the estimation of recommended cross sections for available experimental data in EXFOR library for the considered neutron induced reaction (n,2n) for zirconium target element used in the rods of nuclear reactors. The cross sections analyzing of a complete energy range are reproduced in fine steps of incident neutron energy with 0.01MeV intervals with their corresponding errors. The calculations were focused on the nuclear optical potential where the relevant parameters are selected from References Input Parameter Library (RIPL) which is being developed under the international project coordinated by the International Atomic Energy Agency (IAEA). The calculated activated yield for 90Zr(n,2n)89Zr and 96Zr(n,2n)95Zr reactions based on the complete spectrum of excitation functions, based on gamma ray spectrometry system, has been estimated. The calculated results are analyzed and compared with the experimental data. The activity increases and reaches a saturation value limited by the fast neutron flux at each sample position was determined. The optimized optical potential model parameters give a very good agreement with the experimental data over the energy range 8.2 -20.6MeV. KEYWORDS: Induced neutron reactions, zirconium, recommended cross section, optical potential, activation.
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