Contribution ID: **204** Type: **Poster**

Alpha emission from fast neutron interactions with 64Zn nuclei

In this study, the nuclear process 64Zn(n, a)61Ni induced by fast neutrons on 64Zn nucleus was investigated. Based on the authors' computer programs and Talys codes, cross-sections, angular correlations, and forward-backward asymmetry effects were investigated for incident neutrons with energies from 0.5 MeV to 25 MeV. We investigated how nuclear reaction mechanisms (direct, compound, pre-equilibrium) and discrete and continuum states of residual nucleus 61Ni contribute to the cross-sections. The cross-sections calculated theoretically agree well with our experimental data as well as earlier published data. In the neutron incident and alpha emergent channels, optical potential parameters (with real and imaginary part) with volume, surface, and spin-orbit components were extracted.
The 64Zn(n, a)61Ni reaction generated by fast neutrons show an unusual forward-backward asymmetry effect for neutrons with energies of few MeV. At this energy, compound processes dominate, and direct mechanisms with orders of magnitude lower cannot explain the observed effect. In order to explain the measured forward –backward asymmetry effect, on Zn targets with finite dimensions, spectra of emitted alpha particles were modeled by the direct Monte Carlo method, taking into account the energy loss of alpha particles.

References

[1] C. Oprea, A.I. Oprea, Bulletin of the Russian Academy of Sciences: Physics, Allerton Press Inc. and Springer Nature Switzerland AG, 85, 12, 1471-1478 (2021)
[2] J. Han, J. Liu, X. LiuX. Fan, Zh. Wang, J. Chen, G. Zhang, Yu.M. Gledenov, M.V. Sedysheva, L. Krupa, G. Khuukhenkhuu, P.J. Szalanski, European Physical Journal A 51, 12 (2015)
[3] A.J. Koning, S. Hilaire and M.C. Duijvestijn, TALYS-1.0., Proceedings of the International Conference on Nuclear Data for Science and Technology, April 22-27, 2007, Nice, France, editors O. Bersillon, F. Gunsing, E. Bauge, R. Jacqmin, S. Leray, EDP Sciences, 211 (2008)

Primary author: Prof. OPREA, Cristiana (National Agency for Scientific Research, County Department For Education Bihor)

Presenter: Prof. OPREA, Cristiana (National Agency for Scientific Research, County Department For Education Bihor)

Session Classification: P2 Nuclear Structure, Spectroscopy, and Dynamics

Track Classification: P2 Nuclear Structure, Spectroscopy, and Dynamics