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THE SPECIFIC FEATURES OF PHOTODISINTEGRATION OF 58,60Ni

Wednesday, 13 July 2022 15:00 (20 minutes)

The reliability of experimental cross sections of partial photoneutron reactions (g,1n) and (g,2n) for 58,60Ni obtained using both bremsstrahlung [1-4] and quasimonoenergetic annihilation photons [5] were analyzed using the objective physical criteria. The ratios of partial reaction cross sections to that of neutron yield reaction Fi = CS(g,in)/CS(g,xn) = CS(g,in)/[CS(g,1n) + 2CS(g,2n)] were used. In the cases of (g,1n) and (g,2n) reactions reliable data ratios Fiexp must have values not higher than 1.00 and 0.50 [3] and near the values Fitheor calculated in the combined photonuclear reaction model (CPNRM) [6]. It was obtained that data under discussion [1-4] do not satisfy those criteria. The new reliable cross sections of partial reactions for both 58,60Ni were evaluated using data [5] and experimental-theoretical method [7]: CSeval(g,in) = Fitheor CSexp(g,xn). It was found that the noticeable differences between experimental and evaluated cross sections are because of definite shortcomings of the neutron multiplicity sorting method used [5]. The main reason is that generally the CSexp(g,2n) in reality in a large extent is the CS(g,1n1p). The point is that in the case of 58Ni the threshold B1n1p of the (g,1n1p) reaction is 2.9 MeV smaller in comparison with B2n and the value of CS(g,1n1p) is ˜20 times larger in comparison with CS(g,2n). In the case of 60Ni the correspondent deviations are somewhat less but also very large. The role of (g,1n1p) reaction in the cases of relatively light nuclei is very specific. The sharing of investigated nucleus excitation energy between neutron and proton in the (g,1n1p) reaction is (at least could be) similar to that between two neutrons in the reaction (g,2n) and because of that energies of neutrons from both partial reactions could be near. But outgoing neutron from the reaction (g,1n1p) has multiplicity equal to 1 but both neutrons from the reaction (g,2n) have multiplicity equal to 2. Therefore the reaction (g,2n) cross sections for both 58,60Ni were obtained [5] with significant systematic uncertainties and must not be recommended for using in research and applications.

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The speaker is a student or young scientist

No

Section

1. Experimental and theoretical studies of nuclear reactions

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