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PARTIAL PHOTONUCLEAR REACTION CROSS SECTIONS OBTAINED USING BREMSSTRAHLUNG

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Cross sections of partial reactions, primarily (g,1n) and (g,2n, are widely used in both scientific researches and applications. There are two main methods for obtaining those in various experiments. The majority of CS(g,1n) and CS(g,2n) for was obtained using quasimonoenergetic annihilation photons [1,2] in Livermore (USA) and Saclay (France). The method of photoneutron multiplicity sorting using measured neutron energy was used for direct measurement the cross sections CS(g,1n) and CS(g,2n). For 19 nuclei from 51V to 209Bi investigated in both laboratories significant systematic disagreements were found [3,4]. Using the objective physical criteria of data reliability it was shown that in general partial reaction cross sections obtained using the method of neutron multiplicity sorting are not reliable because the presence of significant systematic uncertainties from the unreliable (erroneous) identification of multiplicity of detected neutron [5]. The most important criteria are that positive ratios Fiexp = CS(g,in)/CS(g,xn) = CS(g,in)/[CS(g,1n)+2CS(g,2n)] for reliable data in the cases of (g,1n) and (g,2n) reactions must have values not higher than 1.00 and 0.50 and near the values Fitheor calculated in the combined photonuclear reaction model (CPNRM). Data on partial reaction cross sections were obtained also using bremsstrahlung. The neutron yield cross sections CS(g,xn) = CS(g,1n)+2CS(g,2n) were measured directly and used for determination of CS(g,2n) using the corrections based on the nuclear reaction statistical theory. After that CS(g,1n) was obtained using the correspondent subtraction procedure CS(g,1n) = CS(g,xn)-2CS(g,2n). The reliability of partial reaction cross sections CS(g,1n) and CS(g,2n) for nuclei 59Co, 58,60Ni, 90Zr, 112,114,119Sn, 127I, 165Ho, 166Er, 181Ta was investigated using the criteria mentioned above. It was found that generally those cross sections are not reliable because of many physically forbidden negative values or values for which F2exp > 0.50. This is the results of some shortcomings in GDR statistical theory description of competition between particle reactions.

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4. V. V. Varlamov et al., International Nuclear Data Committee, INDC(CCP)-440, IAEA NDS, Vienna, Austria, 2004, p. 37.
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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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