

Pre-equilibrium α -particle emission as a probe to study α -clustering in nuclei

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The method of description of the pre-equilibrium alpha-particle emission during the non-equilibrium stage of the nuclear reactions is discussed. An approach was developed to describe the double differential spectra of secondary particles formed in heavy ions reactions. Griffin model of non-equilibrium processes was used to account for the non-equilibrium stage of the compound system formation. Simulation of de-excitation of the compound system was carried out using the Monte – Carlo method. Fission and γ -ray emission were also considered after equilibration. Analysis of the probabilities of neutron, proton and α -particle emission was performed both in equilibrium, and in the pre-equilibrium stages of the process. The theoretical modeling which take into account the possible influence of the cluster structure in the projectile nucleus excited by collision will be discussed together with the comparison between simulated and experimental double differential cross sections of p, α -particles for the $E = 250\text{MeV}$ $^{16}\text{O} + ^{116}\text{Sn}$ reaction, where different clusterization probabilities have been considered.

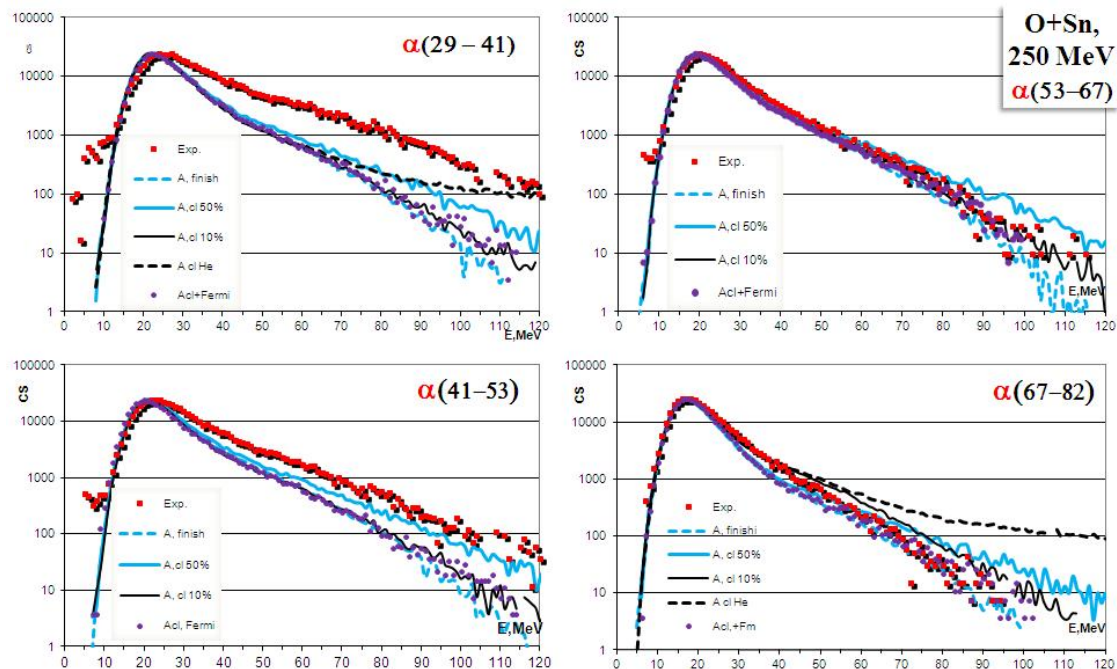


Figure 1: Double differential spectra (Cross-Section (CS) in arbitrary units) for α particles for the 250 MeV $^{16}\text{O} + ^{116}\text{Sn}$ reaction. Experimental data [1,2] are shown in red. Other lines - the results of estimates for different probabilities α -clustering in nuclei

[1] V.L. Kravchuk et al., Int. Journ. Mod. Phys. E 20, 1050c (2011).

[2] O.V. Fotina et al., Int. Journ. Mod. Phys. E 19, 1134c (2010).