Capture and Dissipation in Heavy Ion Induced Reactions

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The nature and the intensity of the nuclear dissipation in capture reactions (quasi-fission and/or fusion-fission) is still a matter of controversy. Indeed, depending on the model and on the experimental results used to constraint them, the dissipation coefficient values can differ by more than two orders of magnitude (1). In addition, even using the same model and the same experimental approach (neutron clock), discrepancies appeared between the values obtained for different systems: one-body dissipation seemed to apply for entrance channel asymmetric systems, more symmetric or heavier systems requested a varying contribution of two-body dissipation. The influence of an eventual mixing of different mechanisms (quasifission and fusion-fission), producing symmetric fragments with very similar properties, was also suggested (2).

More recently, a new analysis protocol (backtracing), providing not only mean values but correlations and distributions for the pre- and post-scission neutron multiplicities (3), allowed, for the first time, a clear disentangling of the two capture processes in the 58Ni + 208Pb system (4) and to reconcile the superheavy systems with one-body dissipation (5).

New experimental results obtained at VIVITRON, Strasbourg and U400, FLNR, Dubna by the DEMON-CORSET and analyzed by an improved backtracing procedure, allowing to handle low statistics data, are presented for different superheavy systems (Z = 102, 114) (6).

Comparison with the predictions of a dynamical model, based on Langevin equation and including one-body dissipation (7), is discussed.

Future experiments and models improvements are presented.

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