Nuclear viscosity in the fission of intermediate fissility systems


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An overview of the recent findings on fission dynamics will be presented. It is well established that fission is a slow process dominated by nuclear viscosity. Nature, strength and temperature dependence of this quantity are still far to be assessed. Systems of intermediate fissility offer the unique opportunity to obtain a reliable estimate of the viscosity as observables in the evaporation and fission channels can be measured simultaneously, providing severe constraints for the relevant parameters of the models [1].

In this framework we have analysed the charged particle multiplicities and cross sections in the evaporation residue and fission channels for the system 180 MeV $^{32}$S + $^{109}$Ag. A comparison of data with the predictions of the statistical model including dynamical effects through the friction coefficient has indicated the one body dissipation as responsible for the slowing down of the process. This is confirmed by very preliminary results obtained by comparing data with simulations based on Langevin approach with the inclusion of a realistic description of particle evaporation.

Along this line, a systematic study is in progress using 8πLP apparatus [2] at the Laboratori Nazionali di Legnaro. This detector system is a powerful device for this study allowing an almost 4π coverage for charged particles and a simultaneous measurement of both fission fragments. Results obtained with this apparatus as well as those from previous measurements reported in the literature will be presented with the aim to gain insight on the role of nuclear viscosity in the fission process.

References