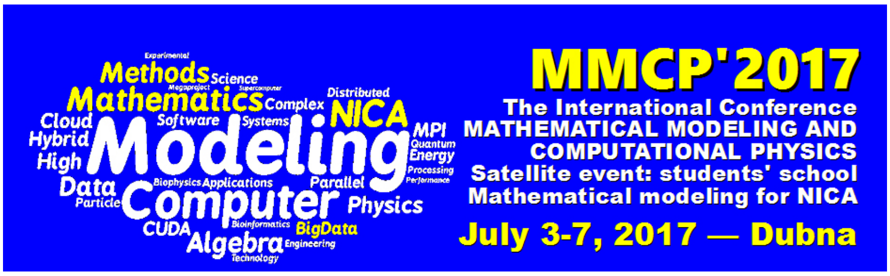

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Transport Description of Heavy Ion Fragmentation Reactions at Energies of 35-140 MeV

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Fragmentation reactions are of interest for the production of exotic beams and for accelerator driven applications. They have been well parametrized by empirical methods, but a microscopic understanding of the mechanism is of great interest. One such method is the transport approach which describes the collision as a Hamiltonian mean field propagation together with a dissipative two-body collision term of the Boltzmann-type including Pauli blocking factors. The propagation is treated in the Euler method, while the collision term is simulated stochastically. Here we present a comparative study of such collisions for light and intermediate mass systems in the energy range from Fermi to intermediate energies in relation to experimental data from the FLNR, Dubna, and other laboratories. The primary fragments obtained from the transport calculation are still excited by several MeV/A and the consideration of their de-excitation is important for the comparison to experiment. This is done using statistical multi-fragmentation approach, where the input of the excitation energies of the primary fragments is calculated consistently with the transport method. We discuss the isotope yield distributions as well as the energy or velocity distributions of the isotopes.
From the evolution with incident energy one sees an evolution of the mechanism of the fragmentation reactions. At the lower energies a substantial direct component is seen , which is not well described by the transport approach, while at higher energies the process is dominantly dissipative and is reasonably well reproduced by transport. This evolution is seen particularly in the velocity distributions, which at lower incident energies display an undamped component, probably due to direct transfer-type processes. The main dissipative component is well described by transport, however, the strongly damped tail of the velocity distribution is not well accounted for. Here most likely fluctuations around the mean field evolution of the system are responsible, the implementation of which is one of the current developments in transport theory.

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