# AMD with Fermi motion, clustering and 3 body collisions

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Abstract

The antisymmetrized molecular dynamics (AMD)[1] is one of the most successful transport models, applied in intermediate heavy ion collisions. AMD usus a frozen (crystal) concept for the initial nuclei and the Fermi motion is taken into account as an average Fermi energy, $T_0 \sim 9$ MeV/nucleon, in the energy calculation. This brings the stability of the initial nuclei in the time evolution, but the quantum fluctuation is lost. In order to restore the quantum fluctuation during the time evolution of the wave packets, a diffusion process is incorporated as a stochastic process in the 1996 version (AMD/D)[2] and enable to reproduce the experimental multifragmentation events reasonably well. Recently it is found that the Fermi motion is also important in the nucleon-nucleon collision process and AMD/D was not able to reproduce the experimental high energy proton yields properly. We incorporated the Fermi motion in the collision term (AMD/D-FM)[3] and successfully reproduced the experimental results measured with the MEDIA detector array[4]. However, when the incident energy is increased around 100 A MeV region, AMD/D-FM also failed to reproduce the experimental high energy proton yields measured at Bevalac in 1980's[5]. Following the pioneer works of Banasera et al. in 1990's[6,7], a 3 body collision term is incorporated in AMD/D-FM, called AMD/D-FM(3N)[8], which can reproduce the experimental high energy proton and neutron data at the incident energies up to 300 A MeV. Currently we are working on the proton and cluster productions with AMDs in $^{12}C+^{1}H$ at 95 A MeV measured at GANIL[9], incorporating the Fermi motion and clustering. We found that the inverse $^{12}C+^{1}H$ collisions provide a unique test bench for the Fermi motion and clustering processes in the particle emissions. I will summarize all these recent results in the talk.

References

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