

Neutron-rich nuclei produced at zero degrees in damped collisions

Deep-inelastic processes between complex nuclei were first observed in the 1960s, and in the 1970s the importance of such reaction mechanism was recognized and theoretical concepts were developed. Characteristic features of deep-inelastic collisions include: formation of a dinuclear system which rotates almost rigidly, nucleons exchange governed by N/Z equilibrium, evaporation of nucleons or/and light clusters followed by the separation into a quasi-projectile (QP) and quasi-target(QT).

It has been long known that QP obtained from short interaction time has minimum exchange of nucleons and they are generally observed around the grazing angle where a maximum in the angular distribution of the QP. On the other side QP obtained from long interaction times can be observed at all the angles, with their kinetic energy decreasing further they are deviated from grazing angle. A second maximum can be expected at forward angles for QP obtained from more nucleons exchanged as illustrated in Wilczynski plot [2]. Until now, measurements close to 0° have not been performed due to the difficult experimental measurement.

An experiment have been performed in GANIL, France, where was studied the deep-inelastic reactions induced by a beam of ^{18}O at 8.6 MeV/A on a ^{238}U target. The quasi-projectiles emitted at an angle $\leq 1^\circ$ were selected and separated using LISE spectrometer. The identification was performed using a dE-E silicon telescope. The double differential reaction cross-section was obtained for stable and neutron rich isotopes around the ^{18}O beam. The momentum distribution obtained for the neutron-rich nuclei will be shown together with the prediction of two different deep-inelastic models: DIT [1] and NNCLE [2].

[1] L. Tassan-Got, C. Stephan Nucl. Phys. A524, 121 (1991).

[2] A.V. Karpov and V.V. Saiko, Phys. Rev. C 96, 024618 (2017).

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