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Fission study using multinucleon transfer reactions

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We have promoted fission measurement using multinucleon transfer (MNT) reactions. The reaction allows us to study fission of many nuclei, including neutron-rich nuclei, which cannot be populated by other reactions [1]. Also, excitation energy (E^*) of compound nucleus distributes widely, which can be used to investigate excitation-energy dependence of fission. The experiments were carried out at the JAEA tandem accelerator facility using ^{18}O beam and various radioactive target nuclei (^{232}Th , ^{238}U , ^{237}Np , ^{243}Am , ^{248}Cm) [2,3]. It was demonstrated that data fission-fragment mass distributions (FFMDs) for more than 20 nuclides were obtained in one reaction, and their excitation energy dependence up to $E^*=60$ MeV was derived. The measured FFMDs were explained by taking into account the multi-chance fission, i.e. fission after neutron emission [4,5]. From the threshold of the excitation function of fission probably, fission barrier height was derived [6].

Our setup for MNT-induced fission allows us to obtain data for MNT mechanism itself. From the fission-fragment angular distribution relative to the rotational axis of the fissioning nucleus, we determined the average angular momentum for each MNT channel [7]. This measurement is useful for the surrogate reaction study, where effects of different spin distribution of compound nucleus between transfer and neutron-induced reaction needs to be properly taken into account.

Reference

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