Fission reactions involving weakly bound stable projectiles

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The reactions involving weakly bound stable projectiles, like ^{6,7}Li and ^{9}Be, show many unusual behaviors compared to those with strongly bound projectiles. The interesting features observed particularly on elastic scattering and fusion cross sections are understood to be the manifestations of the effects of projectile breakup channels present in the reactions. Studies on the effects of projectile breakup on fission reactions are however not much explored. To investigate these effects on fission observables like fission fragment (FF) mass and angular distributions several measurements have been carried out involving ^{6,7}Li projectiles on actinide targets like ^{232}Th and ^{235,238}U [1-6].

A sharp increase in the peak to valley (P:V) ratio of FF mass distribution with the decrease in bombarding energy is observed for ^{6,7}Li+^{238}U reactions. The FWHM of the FF folding angle distribution is found to increase at sub-barrier energies, unlike the reactions involving tightly bound projectiles where a linear decrease is expected. By measuring the cross sections for individual incomplete fusion (ICF) channels quantitative estimates on some of these effects have been attempted to understand the observed discrepancies. The ICF reaction has also been found to be a powerful tool to study fission involving unstable projectile-target combination that cannot be formed using stable heavy ions. The shell effect on FF mass distributions has also been investigated.

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References

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