

"Fission Chips" - Unusual Flavors
(Dynamic nuclear instabilities in fission-like reactions)

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Abstract

Fission of cold nuclei is essentially a binary, adiabatic process, with only a minute probability for the emission of associated light charged clusters. In contrast, nuclear systems in fast heavy-ion reactions respond to significant mechanical and thermal stresses by exhibiting more complex, ternary and quaternary fission-like disintegration patterns. As an example, aligned ternary and quaternary reactions $^{48}\text{Ca} + ^{112,124}\text{Sn}$ are discussed, studied experimentally at a bombarding energy of 45 E/A=MeV.

According to early and modern nuclear reaction theory, limiting capability of nuclei to absorb and dissipate linear momentum may appear in central collisions of complex nuclei even at low relative energies, e.g., at a few MeV above the interaction barrier. An intriguing example of such a process may have been observed in the reaction $^{78}\text{Kr} + ^{40}\text{Ca}$ at E/A=10MeV.

Both types of fission-like reactions occur far off equilibrium and test combinations of nuclear cohesive and dissipative forces.

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