Reaction mechanism studies of high-spin states produced in projectile fragmentation

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A recent experiment at GSI has studied the population of high spin isomeric states in the neutron-deficient N~126 nuclei in order to further understand the reaction mechanism of projectile fragmentation. The particular focus of the experiment was on isomeric states with I > 22 ħ in ²¹¹⁻²¹³Rn, ²¹²At and ²¹³Fr, produced in the fragmentation of a 1 GeV/u ²³⁸U beam impinging on a ⁹Be target. The nuclei of interest were selected and separated in the FFRagment Separator and brought to rest in a passive stopper placed at the focus of the RISING gamma-ray detector array. The intensities of the gamma-rays emitted in the decay of the isomeric states were measured and used to obtain the corresponding population of the high-spin states. These data will be used to test the predictions of theories of peripheral fragmentation. Indeed, following a recent FRS experiment [1] to study the population of the I=43/2 ħ and I=17 ħ isomers in ²¹⁰Ra and ²¹⁰Ra respectively, it was observed that the population at spins greater than 16 ħ was much higher than predicted by either the ABRABLA code [2] or a kinematical fragmentation model [3]. This was thought to be due to a collective component of angular momentum in the fragment which is expected to increase with spin. This has been tested using data from a new recent experiment.

References: