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Isomeric yield ratio measurements of Th(α,f) at 32 MeV

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The mechanism responsible for the generation of the large angular momenta observed in fission fragments is still a heavily discussed question in nuclear physics. Since they are not directly measurable, experimentally accessible observables are used to derive the angular momenta using nuclear model codes. One of these observables is the yield ratio between spin isomers produced in a fission reaction. For this reason, the isomeric yield ratios of twenty-one FFs were measured for Th(α,f) at 32 MeV. To do so, we applied the phase-imaging ion-cyclotron-resonance (PI-ICR) technique using the JYFLTRAP double Penning trap at the IGISOL-4 facility at the University of Jyväskylä. This reaction was chosen in order to compare the newly measured IYR with results from earlier campaigns from U(p,f) at 25 MeV and data in the literature to investigate, e.g., the impact of the initial spin of the compound system on the IYR. In the measurement, isomers are separated with a high mass resolving power, allowing e.g. to resolve the Sn-129 isomeric pair, with a mass difference corresponding to 35 keV. The separated ions are then projected onto a position sensitive detector (MCP). The images produced are then analyzed to calculate the number of ions detected for each state, using angular projection and clustering methods. The measured IYRs are then corrected to account for the MCP efficiency and the decay and feeding effects from eventual precursors in the beam, as the time from extraction to measurement can be comparable to the half-lives. In addition, a newly commissioned multi-reflection time-of-flight mass spectrometer was used to measure eight mass spectra of different isobars. Preliminary results for several measured IYR will be presented and discussed.

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