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Direct Measurement of Independent Isotopic Fission Yields of 252Cf by Mass Spectrometry

Independent isotopic fission yields (IIFYs) are needed for nuclear physics, nuclear astrophysics and nuclear power applications. The measurement of IIFYs is very challenging, as the low kinetic energies of the fission fragments make the identification of heavy products extremely difficult. Consequently, broadband IIFY data remain limited.

We have developed a complementary method for measuring IIFYs via
broadband mass measurements with a Multiple-Reflection Time-of-Flight
Mass Spectrometer (MR-TOF-MS). The fission fragments from a 252Cf spontaneous fission source are first thermalised in the gas-filled Cryogenic Stopping Cell (CSC) and then delivered via an RFQ beamline to the MR-TOFMS for identification and counting. The MR-TOF-MS resolves isobars and some isomers unambiguously, and its non-scanning and broadband nature ensures minimal relative systematic uncertainties amongst fission products. The method includes a self-consistent Monte Carlo technique to account for isotope- and element-dependent efficiency.

This talk will present results obtained at the FRS Ion Catcher (FRSIC),
as well as the Monte Carlo techniques used to benchmark the method. The results include measurements of 58 IIFYs in the heavy-mass fission peak (Z=56–63, N~90) down to the level of ~10–5, with the majority of them measured for the first time.

Type of contribution

Regular Abstract

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