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RECENT RESULTS FROM FRS EXPERIMENTS WITH EXOTIC NUCLEI PRODUCED WITH URANIUM PROJECTILES AND PERSPECTIVES WITH THE SUPER-FRS

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FOR THE FRS- AND FRS-ESR COLLABORATIONS,
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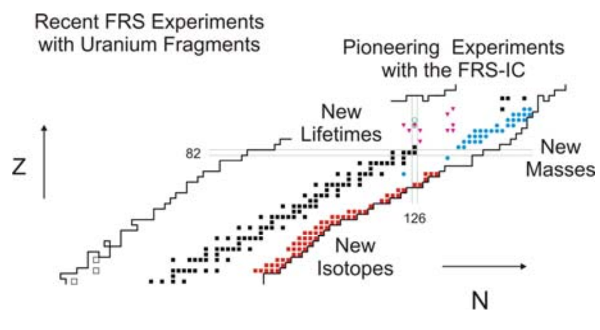
Relativistic exotic nuclei have been produced via uranium projectile fragmentation and fission and investigated with the in-flight separator FRS [1] directly, or in combination with either the storage-cooler ring ESR or the FRS Ion Catcher. The primary uranium beam, accelerated by the heavy-ion synchrotron SIS-18, impinged on the production target with a kinetic energy of up to 1000 A·MeV.

60 neutron-rich isotopes have been discovered in the element range from Nd to Pt and their production cross sections have been measured [2]. Fission is the dominant reaction process contributing to the production of the new neutron-rich isotopes of the lighter elements in this experiment.

In another experimental campaign the fragments were separated in flight and injected into the storage-cooler ring ESR for accurate mass and lifetime measurements. In this experiment we have obtained accurate new mass values of 33 neutron-rich nuclei in the element range from platinum to uranium [3]. In total more than 150 nuclides including references with well-known masses have been covered in this large-area mass measurement. A novel data analysis has been applied which reduces the systematic errors to about 10 keV by taking into account the velocity profile of the cooler electrons and the residual ion-optical dispersion in this part of the storage ring.

Pioneering experiments have been carried out with the FRS Ion Catcher (IC) [4,5,6]. The FRS IC consists of three experimental components, the dispersive magnetic system of the FRS with a monoenergetic degrader, a cryogenic stopping cell filled with pure helium and a multiple-reflection time-of flight mass separator. The FRS IC enables high precision spectroscopy experiments with keV exotic nuclides.

Results from these different FRS experiments will be presented in this overview together with perspectives for the next-generation facility Super-FRS [7]. The novel features of the Super-FRS compared to the present FRS and other facilities in the world will be discussed in addition.



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