

Storage-ring measurements of ground-state and isomer properties

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Ground-state masses and lifetimes, with sensitivity to single stored ions, have been extensively studied in recent years at the GSI Experimental Storage Ring (ESR) facility. In the ESR, fully stripped and few-electron ions typically have energies in the region of 400 MeV per nucleon, orbiting the 108 m circumference of the ring in $0.5 \mu\text{s}$. Electron cooling and Schottky Mass Spectrometry (SMS) have led to high-accuracy ($\Delta E \approx 30 \text{ keV}$) mass measurements covering large numbers of exotic nuclides [1, 2] with half-lives of a few seconds or longer. Half-lives down to a few tens of microseconds are accessible by the technique of Isochronous Mass Spectrometry (IMS), for which there is now much new data [3]. Furthermore, long-lived isomeric states can be studied by the same techniques [2, 4], leading also to new level-structure information in some cases, e.g. ^{125}Ce [5].

Building on these experiences, a complex of new storage rings will be available at the Facility for Antiproton and Ion Research (FAIR) at GSI. The ILIMA (Isomers Lifetimes and Masses) Collaboration, consisting of 78 scientists from 20 institutions in 10 countries, is preparing the new capabilities for measuring the properties of stored exotic ions. Of particular interest will be the study of r -process nuclides at the $N = 126$ closed shell.

The current status of ESR measurements will be presented, together with plans for the new facilities.

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