独立行政法人理化学研究所　仁科加速器研究センター
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Electron-capture delayed fission (ECDF) in the lead region

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Beta-delayed (EC/b^+, b^-) fission is a rare nuclear decay process in which the beta-decaying parent nuclide populates excited states in its daughter, which may then fission. This process allows to study of low-energy fission properties, e.g., the poorly known isospin dependence of the fission barriers of neutron-rich and neutron-deficient nuclei which do not decay via spontaneous fission at all. It is currently believed that in the region of extremely neutron-rich nuclei the b^--delayed fission process is crucial for understanding the r-process path, for fission re-cycling and for the production of the heaviest elements. Unfortunately, such extremely exotic species cannot at present be produced in the laboratory. That is why the underlying mechanisms and properties of beta-delayed fission have to be investigated by using alternative approaches and in other regions of the Nuclear Chart. According to semi-empirical estimates, the neutron-deficient nuclei in the Pb region provide such a possibility.

In the presentation, I will discuss the recent experiments performed by our collaboration at the velocity filter SHIP (GSI, Darmstadt) and at the mass-separator ISOLDE(CERN). In these experiments, ECDF decay was unambiguously observed for the first time in several very neutron-deficient nuclides in the Pb region (^{192,194}At and ^{180}Tl). In particular, for ^{192}At a large ECDF probability P_{ECDF}~10% was measured, which is the highest value so far for any beta-delayed fissioning nuclei. The total kinetic energy was also determined for these nuclei.
Preliminary analysis shows that the cold fission (no neutron emission) might be the main decay channel in the ECDF decay of ^{180}Tl.

These results demonstrate the feasibility and usefulness of the ECDF studies in this region of nuclei. The planned complementary higher-energy fission experiments in the lead region will also be discussed.

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The seminar will be given in English.

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