Quadrupole collectivity of neutron-rich nuclei around ^{132}Sn*

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We report on recent results from our ongoing programme of "safe" Coulomb excitation studies in the surrounding of the doubly magic ^{132}Sn aiming at the determination of $B(E2; 0^+_{\mathrm{gs}} \rightarrow 2^+_1)$ values [1]. Our experiments have been performed at the REX-ISOLDE facility at CERN. We employed the highly efficient MINIBALL γ-spectrometer and a double-sided segmented Si detector (DSSSD) to detect the scattered particles in coincidence with the γ-rays.

This programme was originally motivated by the experimental finding that for Sn and Te isotopes in this region the $B(E2)$ values are lower than expected from systematics indicating a change in nuclear structure far-off stability [2]. In order to clarify the underlying physics, we extended these studies by the investigation of ^{138,140,142,144}Xe, two protons above Te. Except for ^{140}Xe, for which two contradicting $B(E2)$ values are reported in literature, our measurements have been the first above ^{136}Xe. Our results demonstrate that the irregularity in the $B(E2)$ values seems to be a very well localised effect. In the future, we will continue this systematic study to neutron-rich Ba isotopes where larger, maybe even octupole, deformations are expected.

We determined also the $B(E2)$ values for ^{122,124,126}Cd, for the latter two for the first time. Our results agree well with the expectation from systematics. Recently, a new interest in neutron-rich Cd isotopes, two protons below Sn, arose from contradicting results found for ^{130}Cd indicating a quenching of the $N = 82$ shell closure [3] or a prolate quadrupole deformation [4]. To contribute further to this discussion, we are planning to determine the $B(E2)$ value for ^{128}Cd which exhibits an irregular behaviour of the $E(2^+_1)$ excitation energy. A better understanding of the structure of the neutron-rich Cd isotopes is also of astrophysical interest because it allows a more reliable extrapolation of theoretical models to the experimentally not accessible r-process "waiting point" nuclei below ^{132}Sn.

In the future, we will complement the investigation of collective properties by Coulomb excitation with the study of single particle structures by transfer reactions. A new set-up of Si detectors for the detection of light ions is currently under construction. It will allow, in conjunction with MINIBALL, the investigation of (d,p) and (t,p) reactions in inverse kinematics. First experiments will address nuclei around the "island of inversion".

We will present the results from our research programmes and compare them to theoretical models. As well, we will discuss the perspectives for future experiments.

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