Abstract

Nuclei in the neutron-rich A≈100 mass region are well suited for the understanding of evolution of nuclear deformation from spherical to strongly deformed ground-state shapes. By adding only a few neutrons to the N=50 shell closure, deformation and, thus, collective effects occur quickly. For the Z=40 (Zr) isotopes, the neutron number N=56 becomes an effective shell closure, so that ^{96}Zr has characteristics of a doubly-magic nucleus. Adding only a few neutrons more, the Zr-isotopes get strongly deformed. This behavior indicates a shape phase transition around N=60. For the Z=38 (Sr) isotopes the systematics show a similar behavior, whereas for the Z=42 (Mo) and Z=44 (Ru) isotopes, this rapid change of the shape seems to be attenuated.
The aim of this work was to investigate the behavior of the even-even Z=36 (Kr) isotopes in this phase transition region by determining the energies of the 2_1^+ states and their E2 decay transition strengths to the ground state in ^{92}Kr (N=56), ^{94}Kr (N=58) and ^{96}Kr (N=60). Information on the energies of the first excited 2^+ states exist only for the Kr isotopes up to N=58. For N=60, contradictory results on this observable were published recently. Information on the B(E2) values exist only for the neutron-rich Kr isotopes ^{86}Kr, ^{88}Kr and ^{92}Kr.

Therefore, two experimental runs were performed at REX-ISOLDE at CERN in 2009 and 2010, utilizing the high-efficiency MINIBALL gamma-ray spectrometer and analyzing the emitted gamma-rays and scattered particles after the Coulomb-excitation reactions. The basic principles of the theoretical framework, i.e., the spherical and the deformed shell models, as well as the theory of Coulomb- excitation, will briefly be sketched. After introducing the experimental setup, the individual experiments will be presented and the experimental results will be discussed and compared to theoretical predictions.