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Study of Shape coexistence and Triaxial deformation in Cr isotopes via lifetime measurements

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The appearance of a subshell closure in ^{56}Cr (N=32) is confirmed by the high excitation energy of the 2_1^+ state and the B(E2;$2_1^+ \rightarrow 0_1^+$). Shell model calculations are able to reproduce the energy of the first 2^+ state but not the drop of collectivity at N=32 for the Cr isotopes.
The discrepancy between the experimental data and the theoretical calculations for ^{56}Cr may be as a result of coexisting shapes in this nucleus and triaxiality which greatly reduces the B(E2) values. Indeed, calculations performed with the AMD+HFB framework aiming to investigate the triaxial deformation of the states and shape coexistence in this region show coexisting prolate and spherical shapes along the N=32 isotonic chain with the largest deformation in chromium isotopes. Including triaxial deformation in the model lowers the excitation energy of the 2_1^+ state a few hundred of keV and reduces the B(E2) values, being able to reproduce the drop of collectivity at N=32 in agreement with experimental data, but still the theoretical values of B(E2) remain much higher than the experimental ones.
Shape coexistence and triaxial deformation were studied in a recent experiment via lifetime measurements of the 0_2^+ and 2_2^+ states in ^{56}Cr employing the RDDS and the DSAM technique. The states of interest were populated using a transfer reaction: ^{54}Cr(^{18}O,^{16}O)^{56}Cr. The AGATA array was coupled with the SPIDER detector to reach the needed channel selectivity and control the feeding of the states of interest from higher lying states. Experimental results will be discussed in terms of theoretical calculations.

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