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Collectivity evolution of proton-rich Mo isotopes

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The self-conjugate N=Z nuclei have been an intriguing subject for a long time due to their peculiar characteristics for proton-neutron correlations and quadrupole-quadrupole interactions. In particular, a significant shape change has been anticipated among the medium-mass nuclides. The structure of N=Z molybdenum (Z=42) isotope, 84Mo, attracts attention in this viewpoint since the theoretical results represented by the ground-state shape are sensitive to shell model calculation with different model spaces and a choice of the interaction. For example, a shell model calculation based on the Nilsson SU(3) scheme revealed that 84Mo is a transitional nuclide that prolate-oblate shape competition emerges. Thus, a detailed study of the Mo isotope provides valuable results to feedback the nuclear theories. We aimed at investigating the collectivity and shape of 84Mo and its neighbors through a first 2+ state lifetime measurement. The experiment was performed at NSCL/MSU with a 140-MeV/u 92Mo primary beam impinging on a 235-mg/cm2 9Be target. The TRIPLEX plunger setup coupled to the GRETINA was employed to populate the low-lying states and measure the lifetime. The results of the new lifetime measurement for 84Mo and 86Mo are presented. Furthermore, the change of the collectivity around A=70-80 is discussed with the shell model calculation with the DNP-ZBM3 effective interaction.

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