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The first β delayed γ-ray spectroscopy of 109Mo and the interpretation of its low-lying states

The neutron and proton mid-shell region, around N = 60 and Z = 40, is renowned for a sudden drop of first 2^+ state energy in even-even isotopes indicating shape deformation at N = 60 [1-5]. Type II shell evolution is suggested to explain the origin of this shape deformation [6, 7] but more experimental data is required to understand this region. In order to figure out the structural properties of corresponding nuclei, there have been studies on molybdenum nuclei (Z = 42) with N ≥ 60 [5, 8-11]. However, the detailed quasiparticle configuration remains undetermined and recent experimental study on ^{106,108,110}Mo also showed some discrepancies from theoretic calculation in side bands especially on ^{110}Mo [5]. In studying the strongly deformed region, the even-odd nuclei play an important role to understand the neutron quasi-particle states near the Fermi surface.
In the present study, the low-lying states in ^{109}Mo were investigated by measuring the delayed γ-rays after the β decay of ^{109}Nb for the first time under the EURICA project in RIKEN. Two new isomeric γ-rays were measured together with the 69-keV γ-ray from the known isomer [11, 12]. The internal conversion coefficients of the isomeric γ-rays were quantitively studied for the first time. The most like quasi-particle configuration for the ground and isomeric states were assigned considering measured mean lifetime, decay branches, and coincidence counts. One more quasi-particle state was newly assigned to a new exited state strongly populated by the β decay of ^{109}Nb. Our results will give useful restrictions for theoretical models in this region. We will present the experimental results and discuss the quasi-particle configurations of the low-lying states in ^{109}Mo.

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