ROLE OF HEXADECUPOLE DEFORMATION IN THE SHAPE EVOLUTION OF NEUTRON-RICH ND ISOTOPES

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Study of nuclear structures in neutron-rich nuclei along r-process path is important as an input for calculations of elemental abundance. In stable rare-earth nuclei, large hexadecupole deformation is observed especially in Nd ($Z = 60$) isotopes such as ^{148}Nd ($\beta_4 \sim 0.07$). Although, in general, quadrupole deformation is sufficient to explain primary phenomena in nuclei, higher-order deformations can cause significant change in the single particle structures. However, higher-order deformations such as hexadecupole deformation have not been well studied for unstable nuclei far from the line of β-stability. Therefore, it is important to know how such deformation evolves as neutron number increases and how it affects to the single-particle levels.

Isomer spectroscopy on neutron-rich ~60 isotopes was performed at RIBF,

RIKEN Nishina Center. The neutron-rich isotopes were produced using in-flight fission of ^{238}U beam. Fission fragments were identified by measuring the time-of-flight and magnetic rigidity in the BigRIPS. The gamma rays from the implanted nuclei were detected by EURICA, an array of 12-cluster Ge detectors in which each cluster consists of 7 crystals.

Quasi-particle isomers were discovered in neutron-rich Nd isotopes, ^{158}Nd and ^{160}Nd. The results showed some difference in excitation energies of quasi-particle states of Nd isotopes comparing with those of Sm. This was explained by a PSM calculation with larger hexadecupole moment in Nd isotopes than those of Sm. Evolution of single particle levels and its relation with hexadecupole deformation in neutron-rich Nd nuclei will be discussed with experimental results on the isomers.