Contribution ID: **43** Type: **Invited Presentation**

Shape Coexistence in Neutron-rich 31Mg Investigated by Beta-gamma Spectroscopy of Spin-polarized 31Na

Thursday, 1 June 2017 17:20 (15 minutes)

One of the long-standing subjects of nuclear physics is the shape transition of the ground state far from the beta-stability line. In particular, neutron-rich nuclei with neutron number close to the neutron magic number N = 20, so-called the "island of inversion", have attracted much attention. In this mass region of the nuclear chart, it was suggested that the ground states are rather deformed, although these nuclei have a nearly-magic number of neutrons. In the recent theoretical studies [1, 2], not only the ground-state deformation but also shape coexistence were suggested in a low excitation energy region of nuclei in the island of inversion.
In the present work, we study on neutron-rich nucleus 31Mg (N=19). The level structure of odd-mass 31Mg is one of the most sensitive probe of shape coexistence, because the nuclear structure is strongly affected by the configuration of the last neutron. However, up to now, none of the spins and parities, which are the key quantities to understand the nuclear structure, were not firmly assigned except for the ground state. In such a situation, it is rather difficult to discuss the structure of 31Mg. In the present work, the detailed level structure of 31Mg is investigated by our extremely promising method [3] to assign spin-parity of excited states based on the beta-gamma spectroscopy of the spin-polarized 31Na.
The experiment was performed at ISAC in TRIUMF, where a highly polarized 31Na beam is available. Our method is successfully applied to the excited states of 31Mg, and the spins and parities of 5 levels in 31Mg are unambiguously determined by detection of the beta-ray asymmetry. The firm spin-parity assignments for the exited states enable us to compare with the theoretical calculations of the AMD+GCM framework [1] on level-by-level basis. It is found that the levels in 31Mg are categorized into three types of largely deformed rotational bands, states with spherical natures, and a state which cannot be explained by theoretical models at present. The recent shell model [2] also predicts the levels with the three different configurations below 1 MeV, and they are in good agreement with the experimental results. These facts provide clear evidence for the shape coexistence in a low excitation energy region of 31Mg.
References:
[1] M. Kimura, Phys. Rev. C 75, 041302(R) (2007).
[2] E. Caurier et al., Phys. Rev. C 90, 014302 (2014).
[3] K. Kura et al., Phys. Rev. C 85, 034310 (2012).

Primary author: Dr NISHIBATA, Hiroki (RIKEN Nishina Center)

Co-authors: Prof. ODAHARA, Atsuko (Osaka University); Ms YAGI, Ayumi (Osaka University); Mr KANAOKA, Hiroshi (Osaka University); Dr PHILIP, Levy (TRIUMF); Prof. KIMURA, Masaaki (Hakkaido University); Dr PEARSON, Matthew (TRIUMF); Mr KANAYA, Shinnosuke (Osaka University); Mr MORIMOTO, Shota (Osaka University); Prof. SHIMODA, Tadashi (Osaka University)

Presenter: Dr NISHIBATA, Hiroki (RIKEN Nishina Center)

Session Classification: Breakout 1