



## Structure of island-of-inversion nuclei via the alpha induced reactions

Tuesday, 1 July 2014 09:00 (25 minutes)

Structures of the neutron-rich nuclei around  $N = 20$  nucleus  $^{32}\text{Mg}$  have been studied via the direct reactions induced by the isoscalar probe of  $\alpha$  particle. An array of position sensitive segmented Ge detectors, GRAPE, was employed for the in-beam  $\gamma$ -ray spectroscopy. Special attention is paid to single-particle states populated via the nucleon transfer reactions as well as collective states appeared in the inelastic scattering to clarify the shell evolution in the island-of-inversion nuclei. The  $^{32}\text{Mg}$  is known to have large  $B(E2 : 0_{g.s}^+ \rightarrow 2_1^+)$  from the Coulomb excitation and also the proton inelastic scattering. In the present study, we discuss the differential cross sections of  $^{32}\text{Mg}$  and its neighboring nucleus  $^{33}\text{Al}$  with  $\alpha$  particles. We also discuss the systematics of the deformation in this region using the same probe for the cocktail beam of Na, Mg, and Al.

The experiment was performed at RIPS in RIBF, RIKEN. A 63-AMeV  $^{40}\text{Ar}$  beam from the ring cyclotron bombarded the 1-mm thick carbon target. Its fragmentation products were separated by RIPS. The secondary beam bombarded the 150-mm/cm<sup>2</sup> thick liquid helium target. Incident and outgoing particles were identified in event-by-event basis. For the identification of outgoing particles, a TOF-spectrometer consisting of a superconducting triplet quadrupole excitation gamma rays measured with the GRAPE.  $\gamma$ - $\gamma$  coincidence analysis was performed to reconstruct the level structure. For the low-lying levels, the angular distributions of differential cross sections were obtained. The deformation parameter was deduced by DWBA analysis.

In this paper, we will report the excitation structures in island-of-inversion nuclei using the isoscalar probe and discuss their structures from the point of view of deformation.

**Primary author:** Dr OTA, Shinsuke (Center for Nuclear Study, the University of Tokyo)

**Co-authors:** Dr SUZUKI, Daisuke (IPN, Orsay); Prof. IDEGUCHI, Eiji (Research Center for Nuclear Physics, Osaka University); Dr TAKESHITA, Eri (Rikyo University); Dr BABA, Hidetada (RIKEN Nishina Center); Prof. IWASAKI, Hironori (Michigan State University); Dr SUZUKI, Hiroshi (RIKEN Nishina Center); Prof. SAKURAI, Hiroyoshi (Department of Physics, the University of Tokyo / RIKEN Nishina Center); Prof. IEKI, Kazuo (Department of Physics Rikkyo University); Prof. KURITA, Kazuyoshi (Department of Physics, Rikkyo University); Dr NIIKURA, Megumi (Department of Physics, the University of Tokyo); Prof. IWASA, Naohito (Department of Physics); Prof. AOI, Nori (Research Center for Nuclear Physics); Dr TAKEUCHI, Satoshi (RIKEN Nishina Center); Dr MICHIMASA, Shin'ichiro (Center for Nuclear Study, the University of Tokyo); Dr KANNO, Shoko (Department of Physics, Rikkyo); Prof. SHIMOURA, Susumu (Center for Nuclear Study, the University of Tokyo); Prof. NAKAMURA, Takashi (Tokyo Institute of Technology); Prof. MURAKAMI, Tetsuya (Department of Physics, Kyoto University); Dr MOTOBAYASHI, Tooru (RIKEN Nishina Center); Dr FUKUCHI, Tomonori (RIKEN); Mr FUKUI, Toshiaki (Kyoto University); Mr FUJII, Toshihiko (Center for Nuclear Study, the University of Tokyo); Dr KUBO, Toshiyuki (RIKEN Nishina Center); Dr TOGANO, Yasuhiro (Tokyo Institute of Technology); Dr WAKABAYASHI, Yasuo (RIKEN Nishina Center); Dr KONDO, Yosuke (Tokyo Institute of Technology)

**Presenter:** Dr OTA, Shinsuke (Center for Nuclear Study, the University of Tokyo)

**Session Classification:** Session 2

**Track Classification:** Prefer Presentation