Structure of Mg Isotope Studied by β-Decay Spectroscopy of Spin-Polarized Na Isotopes - Shape Coexistence in ^{30}Mg -

A. Odahara[1], K. Tajiri[1], T. Shimoda[1,], M. Suga[1], N. Hamatani[1], H. Nishibata[1], J. Takatsu[1], R. Yokoyama[1], Y. Hirayama[2], N. Imai[2], H. Miyatake[2], M. Pearson[3], C.D.P. Levy[3], K.P. Jackson[3], R. Leguillon[4] and C. Petrache[4]

[1] *Department of Physics, Osaka University, Osaka 560-0043, Japan*
[2] *High Energy Accelerator Research Organization (KEK), Ibaraki 305-0801, Japan*
[3] *TRIUMF, 4004 Wesbrook Mall, Vancouver, BC, V6T 2A3, Canada*
[4] *Université Paris-Sud and Centre de Spectrométrie Nucléaire et de Spectrométrie de Masse (CSNSM), Orsay 91405, France*

Much attention has been paid on the exotic structure of neutron-rich nuclei around "island of inversion", characterized by the neutron magic number $N = 20$ [1]. However, most of the information on the excited states of these nuclei, such as spin and parity, has not been known well.

We have been studying the structure of Mg isotopes in the region of the $N = 20$ island of inversion, to clarify the structure change as a function of the neutron number. The experiments are being performed by our unique method of β-decay spectroscopy taking advantage of highly-spin-polarized radioactive nuclear beams at TRIUMF. The β-decay asymmetry in the Na-isotope decay enables unambiguous spin-parity assignments of the levels in the daughter Mg isotope, and it becomes possible to compare the experimental data and theoretical predictions on a level-by-level basis.

We will present the results of the β decay of ^{30}Na$\rightarrow^{30}$Mg was performed. New 14 γ transitions and new 4 levels in ^{30}Mg have been found in this work. Spins and parities were successfully assigned for 10 levels in ^{30}Mg for the first time by the β-decay asymmetry and γ-ray intensity balance. The decay scheme of ^{30}Na has been constructed. The observed levels and log-ft values were compared with theoretical calculations based on the shell model [2] and HF + RPA method [3]. It is suggested that the ^{30}Mg levels at 1.788 MeV [(0_2^+)], 3.460 MeV [$(2)^+$], 4.967 MeV [1^+], and 5.414 MeV [2^+] have deformed shapes with intruder configurations. The state at 2.466 MeV [(2_2^+)] has different nature both from the spherical ground state and the deformed four levels. It is proposed that the 2_2^+ level is the band-head of the predicted γ-band.

References

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