Study of cluster structure in ^{16}C via α inelastic scattering

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The highly excited states in weakly bound nuclei have recently been attracting considerable interest. In particular, it is important to reveal states with cluster structure which are expected to appear above particle emission threshold energy. On neutron rich nuclei, for example ^{16}C, such cluster states could decay into both α emission and multi-neutron emission because the α emission threshold energy (S_α) is rather higher than those of neutrons.

States which decay into α + residual are expected to be preferably clustered.

We investigated α-cluster states of ^{16}C by means of invariant mass spectroscopy via ^{12}Be + α decay channel.

We performed an experiment at SAMURAI magnetic spectrometer[1] in RIBF. Secondary ^{16}C beam with 200 MeV/nucleon was bombarded on cryogenic liquid helium target[2] with thickness of 150 mg/cm^2. ^{16}C was excited via α inelastic scattering, which is one of the effective reactions to populate cluster states above S_α[3]. Reaction residues are momentum analyzed by the SAMURAI spectrometer. Coincidence γ rays are also tagged by DALI2 γ-ray detector array surrounding the target.

Energy levels of ^{16}C above S_α are reconstructed from four momenta of ^{12}Be and α residues and detected γ-ray energy. Several levels are identified. We will report the experimental result and discuss it by comparison with levels given by an AMD calculation[4].

[1] T. Kobayashi, et. al., Nucl. Instr. and Meth. B317 (2013) 294.

[2] M. Kurata-Nishimura, et. al., RIKEN Accel. Prog. Rep. 46 (2013) 165.

[3] T. Kawabata, et. al., Phys. Lett. B 646 (2007) 6.

[4] T. Baba, Y. Chiba and M. Kimura, Phys. Rev. C 90 (2014) 064319.

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