STUDY OF HIGH-SPIN STATES IN ^{48}Ca REGION INDUCED BY SECONDARY FUSION REACTIONS

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Studies of high-spin states in atomic nuclei by in-beam gamma-ray spectroscopy have provided detailed information on the nuclear structure. In such studies, high-spin states are achieved mostly through a fusion reaction using a combination of a stable-isotope beam and a stable-isotope target, since large angular momentum can be brought to the nucleus of interest in the reaction. However, nuclei produced in the fusion reaction are limited, in many cases, to the proton-rich side relative to the β-stability line. By utilizing a neutron-rich beam in the fusion reaction, nuclei will be produced in the neutron-rich side and the region available for high-spin studies will be largely expanded. Especially, in the ^{48}Ca region, nuclei can not be formed by fusion reaction because it is most neutron-rich Ca isotope. There, onset of collective excitation is expected due to the presence of deformed shell gaps in Z=20 and N=28.

In order to actualize the method, experiments to produce low-energy secondary beams ($\sim$5MeV/nucleon), which is indispensable for inducing the fusion reaction, were performed at the RIKEN accelerator research facility. Neutron-rich secondary-beams, ^{37}P and ^{46}Ar, were produced at the RIPS Facility [1] in RIKEN by the fragmentation reactions of ^{40}Ar and ^{48}Ca primary-beams (63 MeV/nucleon), respectively, impinging on a thick ^{9}Be target. The energy of the secondary beam was lowered by using an Al wedge-shaped degrader at first momentum dispersive focal plane (F1) and a rotatable degrader placed at the second focal plane (F2). The secondary beams were transported to the final focal plane (F3) and irradiated on the secondary ^{9}Be target 10μm thick. By the secondary fusion reactions, ^{9}Be(^{37}P, xn)$^{46-x}$K and ^{9}Be(^{46}Ar, xn)$^{55-x}$Ti, high-spin states of these isotopes were investigated. The intensities of the seconcary beams at F3 were about 1.0×10^{5} counts per second. Gamma rays from the secondary reaction were measured by using the CNS Ge array (GRAPE) [2].

In the conference, experimental results obtained by the above two experiments will be presented.

[1] T. Kubo *et al.*, Nucl. Instrum. Methods **B461**, 309 (1992).
[2] S. Shimoura *et al.*, CNS Annual Report, p5. (2001).