Various Structure In Neutron-rich 31mg Studied By Using Spin-polaried 31na Beam

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As a part of the systematic studies aiming at understanding structures of nuclei located in the neutron-rich N=20 mass region "island of inversion", where unexpected structures such as disappearance of magic number N=20 and etc. were discovered, the excited states of the neutron-rich nucleus ^{31}Mg were studied in the present work. The excited states of ^{31}Mg have been investigated by various types of experiments for a long time, however, none of the spins and parities, which are the key quantities to understand the nuclear structure, have not been assigned until the ground state spin-parity was determined as $1/2^+$ in 2005. Under such a situation, it is very difficult to discuss the structure of the nuclei around the "island of inversion".

In the present work, the detailed level structures of ^{31}Mg were investigated by observing β rays in β decay of spin-polarized ^{31}Na in coincidence with γ rays at TRIUMF, where highly polarized ^{31}Na beam is available. The spins and parities of 5 levels in ^{31}Mg were unambiguously determined by detection of the β-ray asymmetry. Furthermore, efficient γ-ray measurement enabled us to find new 11 γ-ray transitions and propose new 2 levels.

The experimental data were compared with the theoretical calculations of the AMD+GCM framework. It was found that the levels in ^{31}Mg are categorized as follows; i) rotational band, ii) levels with spherical nature, iii) a level which is not understood by the theoretical model. The detailed experimental results and discussion of various structures in ^{31}Mg will be presented.