HAW09-2009-000456

Abstract for an Invited Paper
for the HAW09 Meeting of
the American Physical Society

Isomer spectroscopy using RI beam

ATSUKO ODAHARA, Dep. of Phys., Osaka Univ.

We have studied systematically high-spin oblate shape isomers in the N=83 isotones, which have revealed the characteristics of nuclear structure, such as the preserving pairing interactions at high-spin states, decrease of Z=64 proton shell gap energy as the decrease of proton number from 64 to 60 and so on. Recently, it became possible to search for isomers by the secondary fusion reaction at high-spin states in nuclei, which could not be populated by the stable beam and stable target, using RCNP RI beam line at Osaka University. RI beams enable us to study high-spin states in nuclei in wide mass region. By using the RI beams delivered by RIBF and the high-efficiency γ-ray detection system GRETINA, it will be possible to investigate nuclei far from the stability line. Single-particle energies and nucleon-nucleon interactions of these nuclei close to drip line are expected to be the test ground of nuclear models, such as shell structures. We have a plan to search for isomers with half lives of $\sim\mu$sec to $\sim$msec and to explore the decay mechanism of isomers in the proton-rich nuclei along N=Z line with $80<A<100$. Moreover we try to search for nuclei beyond the proton drip line, which could be defined that isomeric states would be bound by the centrifugal potential although the ground states would be unbound against the proton emission. Isomers are expected to reveal the following characteristics of these nuclei. (1) Existence of isomers could prove the magicity of N=Z=50 and the large neutron-proton interaction, as one of the candidates of isomers is spin-gap isomer which is caused by the lowering of excitation energies resulting from the stretch coupling of spins of high-j ($g_{9/2}$) holes of the ^{100}Sn core. (2) Isomers could prove the nuclear deformation which is caused by the evolution of shell structure. One of spin-gap isomers in ^{94}Ag was reported to have large prolate deformation. (3) This mass region is on the way of the rapid proton (rp) synthesis pass. Recently, neutrino reactions in the super novae were reported to play a role of the synthesis of the rp-process nuclei. In the case of no path or slow down of rp process, isomers could contribute to synthesis of rp-nuclei with larger Z, although the production rates of isomers are small.