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Study of single particle structure of 35Si

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We report on an experimental study which investigated a shell structure in the neutron-rich N=20 region. A lot of experimental works have been made to pin down the nuclear structure around 32Mg, and the results are consistently interpreted that the magic number N=20 disappears in this region. In the framework of shell model, such a shell evolution may be attributed to the variation of the energies of single particle states (SPS) depending on the isospin. However, the single particle structures around the 32Mg have not yet been well investigated experimentally.
We studied isobaric analog resonances (IARs) of 35Si, which is located in the vicinity of 32Mg, by proton resonance elastic scattering on 34Si in inverse kinematics. Assuming an isospin symmetry of nuclear forces, the single particle configuration of IARs are the same as those for the corresponding parent SPSs in 35Si. The spectroscopic information on the IARs can be extracted by R-matrix analysis on the excitation function of the proton elastic scattering [1,2].
A 34Si beam was produced by a 400˜pnA 40Ar beam of 63˜MeV/nucleon and separated with the fragment separator RIPS in the RIKEN Nishina Center. The energy of the beam was degraded to around 5 MeV/nucleon by a thick carbon plate of 90˜mg/cm2 thickness. The beam bombarded on a polyethylene target of 10.9˜mg/cm2 thickness. The recoil proton energy around 12˜MeV was measured by three layers of silicon detectors. Several resonances have been clearly observed in the obtained proton excitation function.
We will present the detailed experimental setup and the preliminary result on the SPS of 35Si.

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