Investigation of N=20 shell closure in neutron-rich nuclei through knockout reactions on ^{33}Mg.

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The mutation of nuclear shell structure far from stability has brought a new view to nuclei. It is important to understand its cause wherein lies perhaps deeper signatures of isospin dependent factors of the nuclear interaction.

The breakdown of conventional N=20 shell closure was observed through systematics of neutron separation energy in Na isotopes[1] and a large B(E2) value in ^{32}Mg[2,3]. The cause for this has been theoretically suggested to be an upward shift of the $d_{3/2}$ orbital[4]. Experimentally, not much is known about the neutron orbital distribution across the N=20 region and hence the cause of its disappearance still needs to be well understood. The location and occupancy of valence neutron(s) can provide insight into the migration of nuclear orbitals.

To address this issue we recently investigated the neutron-rich Mg isotopes through neutron-knockout reaction and interaction cross-section measurements at FRS, GSI. A primary beam of ^{48}Ca interacting with a Be target produced ^{33}Mg. The incident ^{33}Mg nuclei were identified using the Bρ-ΔE-TOF technique using the first half of FRS. The reaction target was ^{12}C located at the dispersive mid-plane of FRS. The one-neutron removal fragment, ^{32}Mg was transported through the second half of FRS and identified at the final achromatic focus using the above-principle. New interesting observations from the one-neutron removal momentum distribution will be reported.

References:

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