OBSERVATION OF THE FIRST 2^+ STATE IN ^{40}Si AND TRENDS IN COLLECTIVITY APPROACHING N=28*

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As nuclei approach the driplines, shell closures may change. The N=8 [1] and N=20 [2] magic numbers are known to fail for neutron-rich nuclei. The collectivity of ^{44}S indicates that the N=28 magic number may be weakened below Z=18 [3,4]. However, this latter observation could also be explained as a localized deformation of the sulfur isotopes [5].

To further understand the evolution of collectivity in this region, a study of neutron-rich silicon, phosphorus, and sulfur nuclei using inelastic proton scattering in inverse kinematics was performed at the NSCL. A primary beam with average intensity 12 pnA of 140 MeV/nucleon $^{48}Ca^{19+}$ was fragmented on a ^{9}Be target. The high acceptance A1900 fragment separator [6] delivered neutron-rich cocktail beams to the target position of the S800 magnetic spectrograph [7]. These beams impinged upon the RIKEN liquid hydrogen target [8], which provided the large number of target atoms needed to perform in-beam spectroscopy on these very neutron-rich nuclei. De-excitation gamma rays were detected by SeGA [9] to select inelastic scattering events, and scattered particles were then identified at the S800 focal plane.

The first observation of the energy and deformation ($\beta_{p,p'}$) of the 2_1^+ state in ^{40}Si and the evolution of M_n/M_p for the ($0_{gs}^+ \rightarrow 2_1^+$) excitation in the nuclei ^{34,36,38}Si will be presented. Newly observed gamma rays from other nuclei within the cocktail beams will be reported. Observations will be compared with shell model predictions.

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