PAIRING EFFECTS ON THE COLLECTIVITY OF QUADRUPOLE STATES AROUND ^{32}Mg

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The observations of the anomalous E2 properties in neutron-rich N=20 nuclei, the large B(E2) values and the low excitation energies in ^{32}Mg and ^{30}Ne [1,2], are clear evidences of the vanishing of the N=20 shell closure. However it is under great debate whether ^{32}Mg is deformed or not. The energy ratios of the first 4^+ and 2^+ states is 2.6 in ^{32}Mg. This value is in between the rigid rotor limit 3.3 and the vibrational limit 2.0.

The purpose of this study is to emphasize the importance of neutron pairing correlations. Generally speaking, neutron 2p-2h configurations can originate not only from deformation, but also from neutron pairing. The shell model calculations have shown the importance of neutron 2p-2h configurations to describe these anomalous E2 properties [3]. It was not clear, however, which effect is more essential.

We have performed Skyrme-HFB plus selfconsistent QRPA calculations for the first 2^+ states in N=20 isotones including neutron-rich ^{32}Mg and ^{30}Ne [4]. Spherical symmetry is imposed to emphasize the roles of neutron pairing correlations. The B(E2) values and the excitation energies are well described not only qualitatively but also quantitatively with the experimental results. If the neutron pairing is dropped, we cannot get the correct E2 properties.

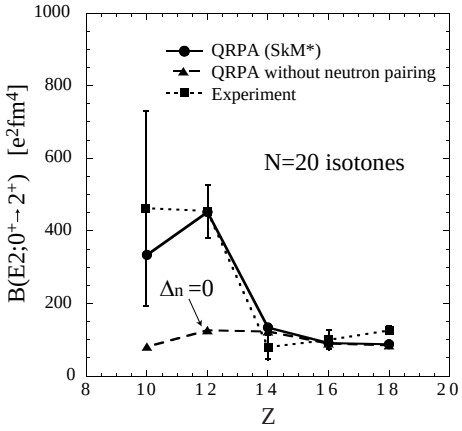

Figure 1: The $B(E2, 0_1^+ \rightarrow 2_1^+)$ values in N=20 isotones given by Skyrme-HFB plus self-consistent QRPA calculations with/without neutron pairing correlations. The experimental data [1,2] are also shown.

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[3] Y. Utsuno, *et al.*, Phys. Rev. C **60**, 054315 (1999).
[4] M. Yamagami and Nguyen Van Giai, Phys. Rev. C **69**, 034301 (2004).