Study of the tensor correlation in oxygen isotopes using mean-field-type and shell-model methods

Satoru Sugimoto

Department of Physics, Kyoto University, Kitashirakawa, Kyoto 606-8502, Japan

The correlation induced by the tensor force plays important roles in nuclear structure. The recent exact-type calculations, for example, the Green's function Monte Carlo calculation and the no-core shell model calculation, show the large attractive energy comes from the tensor force in light nuclei. There still remain many problems on the effect of the tensor correlation to be studied. The effect of the tensor correlation in neutron-rich nuclei is one of such problems. Recently, the tensor correlation in neutron-rich nuclei has been widely discussed. The relation between the shell evolution in neutron-rich nuclei and the tensor force was discussed by Otsuka and his collaborators, and the effect of the tensor correlation on the breakdown of the magic number 8 in ^{11}Li was discussed by Myo and his collaborators. These studies indicate the importance of the tensor correlation in neutron-rich nuclei.

Recently, we have developed a mean-field-type framework which can treat the tensor correlation directly. The one of the most important correlations induced by the tensor force is a 2p-2h-type correlation which is hard to be treated in a simple mean-field framework. To exploit the 2p-2h correlation in a mean-field-type framework we introduce single-particle states with the parity and charge mixing [1]. For the total wave function, the parity and charge projections before variation are performed and a Hartree-Fock-type equation is obtained. We solve the equation (the charge- and parity-projected Hartree-Fock equation) selfconsistently. We applied the CPPHF equation to sub-closed oxygen isotopes and found that relatively large attractive energy comes from the tensor force as shown. We also found that the importance of the blocking effect for j=1/2 orbits on the tensor correlation.

To study the correlation which cannot be treated in the present mean-field-type method, we performed a shell model calculation with 2p-2h configurations including single-particle states with large angular momenta. We found that the large attractive energy comparable to the binding energy comes from the tensor force in ^{16}O and the selectivity for 2p-2h configurations to be mixed by the tensor force, which may have an effect on structure of nuclei related to spin and isospin.

[1] S. Sugimoto, *et al*., Nucl. Phys. A **740**, 77 (2004).