Cluster aspect in C isotopes
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We discuss structure of ground and excited states of C isotopes, while paying attention to cluster aspect. In the neutron-rich nuclei near the drip line, there exist loosely bound three-body systems called as Borromean systems. Also in stable nuclei, we can regard $^{12}$C as a Borromean system when we consider the 3$\alpha$ system, where no bound system consists of two of the three clusters. Recently, the properties of the second 0$^+$ state of $^{12}$C has been successfully described by a gas-like 3$\alpha$ structure. It leads us to expect that loosely bound three-body states may appear in other C isotopes. We propose that the third 3/2$^-$ state of $^{11}$C is a candidate of such a gas-like state. It is supported by the recent observation of small Gamov-Teller transition strength, $B(GT; ^{11}\text{B} \rightarrow ^{11}\text{C}^*)$, measured by charge exchange reactions. We give a discussion of cluster aspect in $^{11}$C. In contrast to the development of three-body clustering in the highly excited states, the clusters are considered to be tightly bound in the low-lying states of C isotopes. In the neutron-rich C isotopes, it is suggested that spatial development of 3$\alpha$ may not appear, instead, compact proton structure is favored. This feature may lead to decoupling of core and valence neutrons in neutron-rich C and has a good contrast to low-lying states of neutron-rich Be which has the strong coupling nature of 2$\alpha$ core and valence neutrons. We study structure of neutron-rich C isotopes and discuss the decoupling of proton and neutron deformations.