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Shells and shapes in exotic nuclei

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The shell structure is one of the most fundamental properties in nuclei. It is important not only in the low-lying energy levels but also in nuclear collectivity. This constitutes part of the reason why the evolution of shell structure in exotic nuclei, often called shell evolution, is being extensively studied in exotic nuclei. In this talk, I give an overview of recent progresses in the understanding of shell evolution and its impacts on nuclear collectivity including shapes. First, some examples of shell-evolution phenomena are presented, where the importance of the tensor force is stressed. Next, the effect of shell evolution on collectivity is discussed. In the $N \sim 28$ region, the deformations of ^{42}Si and ^{44}S are taken. Those nuclei have unusual collective properties due to the quenching of proton and neutron intra-shell gaps caused by the tensor force. In the neutron-rich Ni region, it is shown that shape coexistence is caused by the shell evolution. Contrary to the usual potential picture, the spherical shell structure strongly depends on the configuration of nuclear states, which is proposed to be called Type II shell evolution. The shapes of strongly correlated nuclei can be examined by using the Monte Carlo shell model.