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# Shape coexistence in Ne isotopes and hyperon impurity effect on low-lying states

Based on the beyond-mean-field Skyrme-Hartree-Fock model, we investigate the shape coexistence in Ne isotopes and the effect of $\Lambda$ hyperon on the energy level structure in the nuclei. The up-to-date Skyrme-type $N\Lambda$ interaction SLL4 and the $NN$ interaction SGII are employed. Low-lying energy spectra of $^{20,22,24,26,28,30,32,34}$Ne, including the low-lying states with $J \leq 6$, are predicted, discussed in detail, and found in good agreement with experimental results. The electric quadrupole transition rate is also examined. The coexistences of a ground state rotational band and a $\beta$ vibrational band are revealed in $^{20,22,24}$Ne. Unlike the previously discovered shrinkage effect of $\Lambda_s$ on the ground state nuclei, it is found that the $\Lambda_s$ may alter the excitation mode of the second band by affecting the distribution of the collective wave function, thereby causing the $\beta$ vibrational band transitions to a vibrational band with equidistant energy levels.

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