Rovibrational energy spectra of weakly bounded helium and neon trimers

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A full angular momentum three-dimensional finite element method is used to calculate the rovibrational levels of the weakly bound van der Waals helium and neon trimers. We analyze the ground state energy and the spatial structure of both the symmetric $^4He_3$ and asymmetric $^4He_2$–^3He helium trimers. Three helium-helium hard-core potentials of different origination are used in this study. We investigate two extrapolation procedures based on the convergence properties of the finite element method. For the neon trimer, we compute and discuss rovibrational spectra up to the total angular momentum $J = 3$ for both the positive and negative parity. Energy levels of all different permutational symmetries are calculated. We also predict a possible zero angular momentum shape resonance of the neon trimer.