Ξ^{12}C(0^+) and Ξ^{16}O Potentials Derived from the SU_6 Quark-Model Baryon-Baryon Interaction

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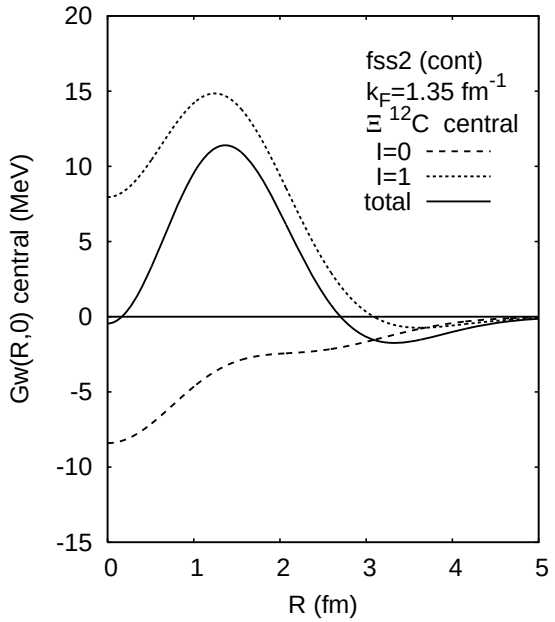
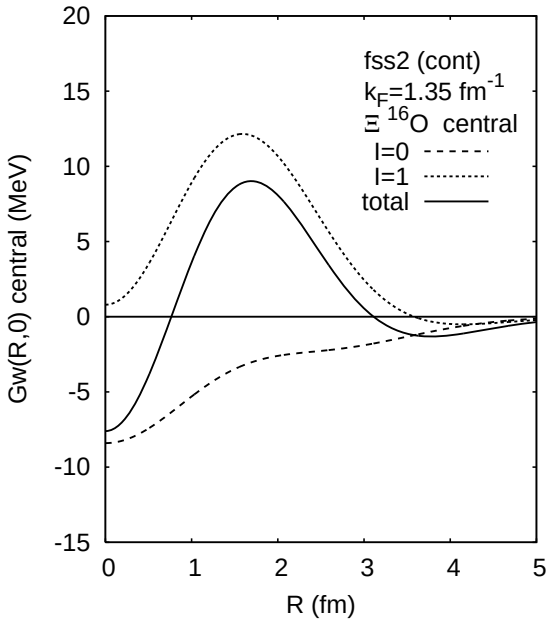
In the previous publication, we have studied $B_8\alpha$ [1,2] and $B_3(3N)$ potentials based on the G-matrix calculations of the quark-model (QM) baryon-baryon interaction [3] within the framework of the lowest-order Brueckner theory. Here, B_8 stands for one of the octet baryons, and $(3N)$ the triton or ^{3}He. We extend this method to the $B_8{}^{12}$C(0^+) and $B_8{}^{16}$O systems, and investigate what kinds of new features appear when the core nuclei involve the p-shell orbits. The wave functions of ^{12}C(0^+) and ^{16}O are assumed to be rigid translationally invariant harmonic-oscillator shell-model wave functions with the size parameters $\nu = 0.20$ fm^{-2} and 0.16 fm^{-2}, respectively. The G-matrix calculations are carried out with the energy-independent renormalized RGM kernel [4] of the QM baryon-baryon interactions fss2 and FSS. The Ξ^{12}C(0^+) and Ξ^{16}O potentials, obtained as the zero-momentum Wigner transform of the folding kernels for the G-matrix interaction with the Fermi momentum $k_F = 1.35$ fm^{-1}, are illustrated below for fss2. We find a weak attraction in the surface area around $R \sim 3$ - 4 fm, which is a common feature to the previous $\Xi\alpha$ potential [1]. The present potentials, however, also possess an attractive pocket in the short-range region with $R \leq 1.2$ fm, which originates from the strong attraction in the isospin $I = 0$ component of the ΞN interaction. This feature is clearly related to the p-orbit of the core nuclei. Such a structure of the nuclear potentials should appreciably influence on the Coulombic bound states for the Ξ^- atoms.





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