Abstract

The pair distribution function *g(r)* for a system of bosons interacting through a two-body potential composed of a hard core followed by a square well has been obtained using the reaction matrix formalism for the energy excitation spectrum *Ek* and the fundamental definition relating the structure factor *S(k)* and *g(r)*. This has been used in obtaining the ground state energy of solid ^{4}He using the kinetic energy and potential energy expressions of Hansen and Levesque. The most stable ground state of solid ^{4}He corresponds to a potential width of b = 3.8 Å, but the corresponding ⟨E⟩/N for the density, ϱ, of solid ^{4}He is very large compared with the experimental value. However, for b = 4.81 Å and $\varrho = 2.8 \times 10^{22}$ particles/cm^3, ⟨E⟩/N = -11.24 K = -93.4 Joule/mol, and for b = 4.82 Å and $\varrho = 2.5 \times 10^{22}$ particles/cm^3, ⟨E⟩/N = -6.84 K ≈ -56.8 Joule/mol. The experimental value for the ground state energy of solid ^{4}He is -59.5 J/mol.