ELECTROSTATIC ENERGY OF COULOMB CRYSTALS WITH POLARIZED ELECTRON BACKGROUND

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It is generally accepted that the neutron stars crusts and white dwarfs interiors consist of a degenerate electrons and atomic nuclei arranged into a crystal lattice. This solid system is usually described by the Coulomb crystal model. In the current work we study electrostatic properties of Coulomb crystals. We use several different approaches to consider the influence of the electron background polarisation. At zero temperature the electrostatic energy brings a fundamental contribution to the total energy of the crystal, which allow to study structural transitions in degenerated stars. It was shown that at high densities a bcc lattice is uniquely formed, while at $\rho \lesssim 10^6$ g cm^{-3} formation of the fcc and hcp lattices is possible. Specifically, at what density such transitions occur significantly depends on the charge number of ions in the lattice sell.