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Variational path-integral treatment of a translation invariant many-polaron system[1] FONS BROSENS, SERGEI N. KLIMIN, JOZEF T. DEVREESE, Departement Fysica, Universiteit Antwerpen, B-2610 Antwerpen, Belgium — The ground-state properties of a translation invariant N-polaron system are theoretically investigated for an arbitrary electron-phonon coupling strength, using a variational principle for path integrals for identical particles. A rigorous upper bound for the ground state energy is found as a function of the number of spin up and spin down polarons, taking the electron-electron interaction and the Fermi statistics into account. For sufficiently high values of the electron-phonon coupling constant and of the ratio of the static and high-frequency dielectric constants $1/\eta = \varepsilon_0/\varepsilon_\infty$, the system of N interacting polarons can form a stable multipolaron ground state. When this state is formed, the total spin of the system takes its minimal possible value. For a stable multipolaron state, the addition energy reveals peaks corresponding to closed shells. This feature of the addition energy, as well as the total spin as a function of the number of electrons, might be resolved experimentally using, e.g., capacity and magnetization measurements.

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