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A many-polaron system in a background-charge potential[1] F. BROSENS, S. N. KLIMIN, J.T. DEVREESE, –TFVS, Departement Natuurkunde, Universiteit Antwerpen — The ground state energy of an N-polaron system confined to a quantum dot with a neutralizing background charge is investigated within an all-coupling many-body path-integral variational principle taking into account both Fermi statistics of polarons and the electron-electron interaction. The treatment of the ground-state energy is performed for both closed-shell and open-shell systems. The electron-phonon contribution to the ground-state energy as a function of the number of fermions demonstrates a trend to a constant value when increasing N. For a finite number of polarons, the dependencies of the ground-state energy and of the polaron contribution on the parameter r_s^*, which determines the average fermion density in a quantum dot, are very similar to those for a polaron gas in bulk. Herefrom, we can conclude that the ground-state properties of a polaron gas in bulk can be qualitatively described using a model of a finite number of polarons in a confinement potential provided by a background charge.

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Fons Brosens
Universiteit Antwerpen

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