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Quark-Meson-Coupling (QMC) model for finite nuclei, nuclear matter and beyond

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Abstract

The Quark-Meson-Coupling model, which self-consistently relates the dynamics of the internal quark structure of a hadron to the relativistic mean fields arising in nuclear matter, provides a natural explanation to many open questions in low energy nuclear physics, including the origin of many-body nuclear forces and their saturation, the spin-orbit interaction and properties of hadronic matter at a wide range of densities up to those occurring in the cores of neutron stars. Here we focus on four aspects of the model (i) a full comprehensive survey of the theory, including the latest developments, (ii) extensive application of the model to ground state properties of finite nuclei and hypernuclei, with a discussion of similarities and differences between the QMC and Skyrme energy density functionals, (iii) equilibrium conditions and composition of hadronic matter in cold and warm neutron stars and their comparison with the outcome of relativistic mean-field theories and, (iv) tests of the fundamental idea that hadron structure changes in-medium.

Keywords: Quark-Meson-Coupling, Nuclear structure, Nuclear Matter,

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