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Exchange-correlation energy functionals for low-dimensional electronic nanostructures: Recent developments and applications[1] STEFANO PITTALIS, University of Missouri-Columbia, U.S.A., E. RÄSÄNEN, Nanoscience Center, University of Jyvaskyla, Finland, C.A. ROZZI, University of Modena, Italy, G. VIGNALE, University of Missouri-Columbia, U.S.A. — In the analysis of low-dimensional electronic nanostructures, the evaluation of the consequence of the electron-electron interaction is a challenging task. In particular, an accurate determination of the exchange-correlation energy in two-dimensional systems is of great importance in understanding the many-body physics of modern electronic devices. Here we review several approaches within density functional theory, spanning from the bottom to the top of the ladder of functional approximations. Considering applications to quantum dots, rings, slabs, and periodic systems, we conclude that the presented approaches form a valuable first-principle toolkit for dealing with the many-body physics of such devices.

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