Modulation Doping in Mott Insulators

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We argue that interesting strongly correlated two-dimensional electron systems can be created by modulation doping near a heterojunction between Mott insulators. Because the dopant atoms are remote from the carrier system, the electronic system will be weakly disordered. We argue that the competition between different ordered states can be engineered by choosing appropriate values for the dopant density and the setback distance of the doping layer. In particular larger setback distances favor two-dimensional antiferromagnetism over ferromagnetism. We estimate some key properties of modulation-doped Mott insulator heterojunctions by combining insights from Hartree-Fock-Theory and Dynamical-Mean-Field-Theory descriptions and discuss potentially attractive material combinations, along with some of the obstacles that stand in the way of transferring materials engineering strategies from weakly-correlated to strongly-correlated systems.