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Double-exchange driven metal-insulating transition in Mn-doped CuO ALESSIO FILIPPETTI, VINCENZO FIORENTINI, SLACS and Physics Dept., University of Cagliari, Italy — Doping antiferromagnetic CuO with Mn causes a uncommon metal-insulating transition where the low-temperature ($T < T_c$=80 K) phase is ferromagnetic, with a large but metallic-like resistivity, while the high-temperature phase is paramagnetic and insulating, but with a resistivity typical of Mott insulators in the hopping conducting regime. Applying a first-principles, self-interaction corrected local spin density approach, we are able to understand and rationalize this puzzling behavior: each doping Mn in CuO acts as a single donor, inducing a double-exchange driven metallic regime and a Mn-Mn ferromagnetic allignement. Nicely, here double-exchange can also work at rather low Mn concentrations since carriers can freely flow within the CuO (x,y) planes and only need the Mn assistance to move through the c axis. In the antiferromagnetic phase the system is insulating, but a polaron hopping conductivity through a few meV-wide Coulomb gap is envisaged. This scenario depicts the intriguing possibility of designing double-exchange driven ferromagnetic cuprates.

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