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Charge and spin order on the triangular lattice — $\mathbf{Na}_x\mathbf{CoO}_2$ at $x = 0.5$ SEN ZHOU, ZIQIANG WANG, Boston College — The nature of charge and spin order of strongly correlated triangular lattice fermions is investigated in connection to the unconventional insulating state of Na_xCoO_2 at $x = 0.5$. We study an extended Hubbard (t-U-V) model of the electron doped Co a_{1g} band using a spatially unrestricted Gutzwiller approximation. We find a new class of charge and spin ordered states at $x = 1/3$ and $x = 0.5$ where the system alleviates antiferromagnetic (AF) frustration via charge inhomogeneity. We show that the $\sqrt{3}a \times 2a$ off-plane Na dopant order at $x = 0.5$ plays an important but subtle role. It induces weak $\sqrt{3}a \times 1a$ charge order in the Co layer without gapping the Fermi surface and allows successive $\sqrt{3}a \times 1a$ AF and $2a \times 2a$ charge/spin ordering transitions at low temperatures. The nesting with the $2a \times 2a$ hexagonal zone boundary gaps out almost the entire Fermi surface at $x = 0.5$. We study the phase structure and compare to the findings of recent experiments.

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