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**The**
**Paired Electron Crystal in quarter-filled organic superconductors**[1] R.T. CLAY, S. DAYAL, Mississippi State University, H. LI, S. MAZUMDAR, University of Arizona — In the 2D organic superconductors the underlying carrier density in the conducting layers is 1/2 electron per molecule. Because molecules often occur in dimer pairs, an effective model is frequently used with one electron per dimer. With strong electron-electron correlations, this effective model describes the occurrence of antiferromagnetism. Because of lattice frustration, $\kappa$-$(ET)_2Cu_2(CN)_3$ and other organics have been suggested to have spin liquid ground states. Recent experiments however have found strong lattice effects at low temperature in this material and raised uncertainty whether excitations are gapped or gapless. We argue that to resolve these issues one must go beyond the effective dimer model and instead start from the underlying 1/4-filled band. We have recently shown that in 2D 1/4-filled strongly correlated systems a commensurate insulating state forms that we have termed a Paired Electron Crystal (PEC). While in the antiferromagnetic state charge densities are uniform within a dimer, in the spin-gapped PEC state dimer charges become unequal and pairs of charge-rich sites are separated by pairs of charge-poor sites. We review the PEC concept and explain how it can provide a unified theoretical view of the 2D organics.

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