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A variational cluster study of possible phase separation in square and honeycomb Hubbard lattices KUN FANG, GAYANATH FERNANDO, University of Connecticut, ALEXANDER BALATSKY, Los Alamos National Laboratory, ARMEN KOCHARIAN, California State University — The Hubbard model is examined for possible electronic phase separation using the variational cluster approximation in square and honeycomb geometries. The phase separation is found when different electronic states with different electronic densities n share the same chemical potential μ, so that these states can coexist at equilibrium and be distributed inhomogeneously throughout the lattice. The phase separation is clearly identified in the square lattice but, surprisingly, it is not discovered in the honeycomb lattice in a similar region of on-site Coulomb interaction and hole doping. The phase separation instability found in the square lattice is signatured by the disappearance of a set of one particle spectra around the k-point $(\pi/2, \pi/2)$ in momentum space. The electronic state associated with the set of spectra is due to scattering of electrons at the antiferromagnetic (AF) Brillouin zone boundaries and responsible for the phase separation. To our knowledge, no previous publications reveal such an anomalous state. The honeycomb lattice does not show the corresponding anomalies due to its different geometry, so that there is no such phase separation in the honeycomb lattice. Our VCA provides strong support for phase separation instability driven by electronic cor

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