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Phase separation instabilities and pairing in layered BSCCO-like lattice geometries ARMEN KOCHARIAN, California State University, Los Angeles, KUN FANG, GAYANATH FERNANDO, Connecticut University, Storrs, ALEXANDER BALATSKY, Los Alamos National Laboratory, Los Alamos, KALUM PALANDAGE, Trinity College, Hartford — The electron spontaneous phase separations accompanied by local inhomogeneities are evaluated by monitoring the charge and spin pairing gaps in the ground state and corresponding crossovers at finite temperatures in various cluster geometries and wide range of inter-site interaction U. The effects of the next nearest neighbor hopping on electron instabilities at level crossings in the vicinity of quantum critical points are considered. The calculated energy gap at one hole away from half filling displays universal features consistent with the lattice structure symmetry in non-bipartite geometries. The charge and spin collective excitations in layered pyramidal structures driven by out-of-plane variation of lattice parameters yield intriguing insights into the coherent and incoherent pairings and gap modulations in Bi-like based cuprates, iron pnictides, and other transition metal oxides layered structures. The phase diagrams resemble a number of inhomogeneous, coherent and incoherent nanoscale phases seen in $Bi_2Sr_2CaCu_2O_{8+\delta}$. The found similarities and differences in the mechanisms of electron pairing, driven by attractive and repulsive electron interaction are analyzed. The phase separation instabilities in related intercalated layered geometries are discussed.

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