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Ferromagnetism and electron pairing in tetrahedral Hubbard clusters ARMEN KOCHARIAN, Department of Physics and Astronomy, California State University, GAYANATH FERNANDO, TUN WANG, KALUM PALANDAGE, Department of Physics, University of Connecticut — The canonical and grand canonical calculations in exactly solvable three dimensional tetrahedrons elucidate the origin of Mott-Hubbard-like transition, electron pairing and ferromagnetism in frustrated Hubbard clusters. The thermal properties of planar and tetrahedral clusters in magnetic field with one hole off half-filling provide a rigorous proof for the existence of Mott-Hubbard type insulators with spontaneous magnetization in the ground state and finite temperatures. Rigorous conditions for electron pairing instability and phase separation in frustrated tetrahedral cluster for all $U > 0$ is also provided. We show that Nagaoka-type spin flip instability with "unsaturated ferromagnetism" is equivalent to electron charge and spin pairing instabilities with minimal, zero *spin*. The theory gives strong evidence for existence of charge- spin separation in three dimensional clusters and calculated phase diagram for condensation crossover temperatures at various instabilities encompass a number of phases recently discovered in clusters, small nanoparticles, transition metal oxides and high T_c cuprates.

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