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Electronic and Magnetic Phase Transitions Induced by External Magnetic Field and Hund's Coupling in the Spin-1/2 Falicov–Kimball Model on a Triangular lattice

Numerical and Monte-Carlo simulation methods are employed to study the spin-1/2 FalicovKimball model on a triangular lattice in the presence of external magnetic field and Hund's coupling. At small Coulomb correlation, the system exhibits a magnetic-field driven metal–insulator transition accompanied by a change in ground state configurations from segregated to Neel-ordered regular, quasi-regular, and mixed phases along with significant variation in the magnetic moments of localized and itinerant electrons at various chosen values of Hund's coupling. While at high Coulomb interaction, the system remains insulating and no metal–insulator transition is observed with external magnetic field. These results of tunability of electronic and magnetic properties can be used to create electric and magnetic sensors and high energy storage devices.

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