SFB/TRR 21 - Seminar

3. Mai 2012, Stuttgart

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Emergent phases of correlated electrons in transition metal oxides

The electric and magnetic properties of transition metal oxides are in many casesoften dominated by electrons in d-orbitals. Large Coulomb repulsion between electrons accommodated in the spatially constrained d-orbitals tends to block the motion of electrons from one atom to another, atom and the electrons are highly entangled. Just like interacting atoms and molecules, the entangled electrons, called correlated electrons, form solid (insulator), and liquid (metal), and superfluid (superconductor) states inside the solid. The presence of the three degrees of freedom attached to electrons – , charge, spin and orbital, enrich these electronic phases further. A variety of solid and liquid phases, with complex combinations of charge, spin, and orbital ordered states, indeed appearshows up in the phase diagrams of transition metal oxides. I will first show appealing examples of such exotic phases of correlated electrons, including nano-stripes in cuprates, quantum liquid states of spins and charges in spinel related oxides. I will then discuss the possible device functions coming out of the concept of electron phases, with emphasis on phase change functions.

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