FOXSI
Functional Oxide Surfaces and Interfaces

EINLADUNG

zum Vortrag
von

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Novel Quantum Phenomena in Perovskite Ruthenates.

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Abstract:

Strongly correlated oxides have been the subject of intense study for the last two decades. Many of these materials exhibit exciting and technically useful properties; examples include high temperature superconductivity, colossal magnetoresistance, ferromagnetism and ferroelectricity. Perovskite ruthenates $(Sr,Ca)_{n+1}Ru_nO_{3n+1}$ have become a focus in this field, since they exhibit a rich variety of fascinating ordered ground states, such as spin-triplet superconductivity, itinerant magnetism, field-tuned nematic phase, orbital ordering and Mott insulator behavior. The close proximity of these exotic states testifies to the delicate balance among the charge, spin, lattice and orbital degrees of freedom in ruthenates, and provides a remarkable opportunity for observing novel quantum phenomena through controlling external stimuli. In this talk, I will first give a brief overview of research in this area, and then discuss our progress in studies of these materials. Our research focuses on single crystal growth and characterization of double-layered ruthenates. We have established a complete phase diagram of magnetic and electronic properties of $(Sr_{1-x}Ca_x)_3Ru_2O_7$, in which we discovered a novel quantum phase with slow dynamics near a quantum phase transition. We have also studied Ti doping effect on $Ca_3Ru_2O_7$. We find that $Ca_3Ru_2O_7$ can be tuned from the quasi-2D metal with ferromagnetic bilayers to the Mott-insulating state with the G-type, nearest-neighbor antiferromagnetic order as Ti concentration is increased above 5%. I will discuss the mechanism for such unique electronic and magnetic phase transitions induced by Ti doping.

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