In Operando Electronic Structure of Quantum Materials

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In electronic devices such as a field effect transistor, materials are exposed to electrostatic doping and the presence of a transport current. This does not affect the basic properties of a conventional material such as silicon. Quantum materials, on the other hand, can fundamentally change their properties under these conditions because their ground states are dictated by a delicate and fragile balance between several interactions on a similar energy scale. Examples of this are electrically driven charge density waves, insulator-to-metal transitions in Mott insulators or the breakdown of superconductivity with an applied current density.

One of the most important tools for studying quantum materials in equilibrium is angle-resolved photoemission spectroscopy (ARPES), as this gives direct access to the sample's spectral function. Very recently, ARPES has also been applied to non-equilibrium situations such as doping [1,2,3] or transport currents [4] in simple *in-operando* electronic devices [5]. In this talk, I will review these developments and illustrate the power of non-equilibrium experiments by ARPES on simple devices made from two-dimensional materials. Finally, I will present first ARPES results on the current-induced insulator to metal transition in the Mott insulator Ca_2RuO_4.

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