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ABSTRACT

Electronic Transport and Switching of Charge Density Waves in 2D Materials

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Layered transition metal dichalcogenides (TMDs) host a plethora of exotic ground states such as superconductivity, Mott insulator, and charge density wave (CDW) states. Unlike the one-dimensional case of CDWs, a typical manifestation of Peierls distortion, understanding the origin of CDWs in two and three-dimensional materials is compounded by other mechanisms such as q-dependent electron–phonon coupling or excitonic CDW. Besides the highly fundamental interest in understanding these fascinating electronic structures, the control of CDW phases can be exploited for various applications such as oscillators and data storage. In that respect, intercalated compounds represent an interesting solution to modify CDW phases. Also, in cases of coexisting multiple CDW states in a material, the question of whether switching between these CDWs can be manipulated or controlled has been studied less.
In this seminar, I will present recent experimental and theoretical results on the manipulation using a Scanning Tunneling Microscope (STM) tip of CDW phases in 2D materials and the consequences on the electronic transport properties. I will show how it is possible to induce transitions and to manipulate CDW phases, leading to potential applications.

[1] U. Chazarin et al., Nano Letters, 24 (2024) 3470.
[2] U. Chazarin et al., Adv. Mater. Interfaces, (2022) 2201680.