ERNST-ISING-DISSERTATIONSPREIS PHYSIK

Imaging many-body effects in 2D materials with the scanning tunneling microscope

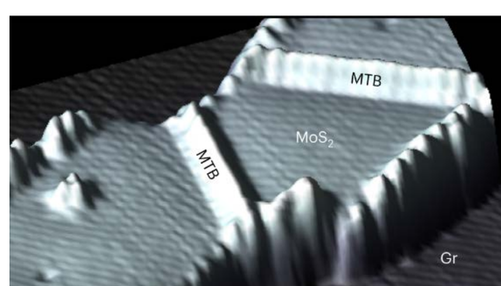
Dr. Camiel van Efferen

Tuesday, June 17th, 2025, 16.30 h, Lecture Hall III

Abstract

When we reduce the dimensionality of a material, the electrons within it start to interact strongly, giving rise to emergent many-body states such as charge density waves, Luttinger liquids or polarons. If we want to fully understand the physics at play in these fundamental states of matter, we require an experimental realization of low-dimensional materials that preserves the correlated properties of an ideal, isolated system, so that it is as close as possible to our best theoretical models. At the same time, we should still be able to measure and control the correlated states of interest.

In my talk, I will show that single layers of 2D materials on a graphene on iridium(111) substrate provide us with just such a versatile, tunable platform for many-body physics. We take a specific look at monolayers of VS2 and MoS2, which have an impressive range of correlated phenomena to offer, neatly divided between the two of them. Using the scanning tunneling microscope, we can simultaneously resolve the topography and electronic structure of the 2D layers, allowing us to compare our experiments directly with theories based on the underlying physical processes out of which the emergent many-body states arise.



UNIVERSITÄT
ZU KÖLN