<u>Electronic Structure in Novel Epitaxial 2D Systems</u>

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Because of the recent explosion of interest in two-dimensional (2D) material systems, and because of the tremendous potential these materials hold not only for device applications but also for the fundamental study of exotic physics in the solid state, the question of how to fabricate these materials in controllable and scalable ways has become urgent. As fabrication capabilities have expanded to meet this need, the role of substrate interactions is increasingly understood to be crucial in determining these materials' complex electronic properties.

At the SGM3 beamline of the ASTRID2 synchrotron light source in Denmark, we use an epitaxial approach to fabricate novel 2D material systems *in vacuo.* I will explain this technique, which allows us to controllably produce well-oriented single-crystal domains with low defect density. Taking advantage of the high quality of these samples, we have been able to investigate, for a variety of systems based on semiconducting and metallic 2D transition metal dichalcogenides (TMDCs), the complex interactions that emerge between an epitaxial single layer and a metallic substrate. I will present studies based on angle-resolved photoemission spectroscopy (ARPES), including time-resolved studies, of 2D TMDCs on metallic substrates. I will, further, present and discuss data acquired by scanning tunneling microscopy/spectroscopy (STM/S) and low-energy electron diffraction (LEED). Our findings highlight the power of substrate interactions to strongly modify the electronic properties of 2D TMDCs relative to those of bulk TMDC analogues, and relative also to theoretical predictions based on calculations for freestanding layers. I will discuss the intriguing outlook for future work in this area.