

Contribution submission to the conference Dresden 2026

Rise and fall of 1T-TaS₂: Epitaxial growth of monolayer TaS₂ on Au(111) — •LARS BUSS¹, CATHY SULAIMAN¹, RAQUEL SÁNCHEZ-BARQUILLA¹, IULIA COJOCARIU², MARCIN SZPYTMA³, TEVFIK ONUR MENTEŞ², ANDREA LOCATELLI², JENS FALTA⁴, and JAN INGO FLEGE¹ — ¹Applied Physics and Semiconductor Spectroscopy, BTU Cottbus-Senftenberg, Cottbus, Germany — ²Elettra-Sincrotrone Trieste S.C.p.A, Basovizza, Trieste, Italy — ³Faculty of Physics and Applied Computer Science, AGH University of Krakow, Poland — ⁴Institute of Solid State Physics, University of Bremen, Germany

Two-dimensional TaS₂ has attracted extensive research interest due to its ability to exhibit electron correlation effects, including charge density waves (CDWs). In particular, 1T-TaS₂ is of interest as it shows a CDW at room temperature. However, when grown on metal substrates, only 2H-TaS₂ has been reported. To elucidate the reasons for the apparent lack of 1T-TaS₂ growth in the literature, we have investigated the growth of TaS₂ on Au(111) employing *in situ* low-energy electron microscopy (LEEM) and micro-diffraction (μ LEED) as well as X-ray photoemission electron microscopy (XPEEM) [1]. We show that at elevated temperatures TaS₂ nucleates and grows in the metastable 1T-TaS₂ phase, which transforms into the stable 2H-TaS₂ phase via a temperature-activated process and then continues to grow at a considerably lower rate. Furthermore, we observe CDW-like ordering in 1T-TaS₂/Au(111), though it is suppressed in 2H-TaS₂/Au(111).

[1] L. Buß et al. Phys. Rev. Materials **9**, 074006 (2025).

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