Continuous Tuning of Electronic Correlations by Alkali Adsorption on Layered 1T-TaS$_2$

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Motivation

- Measure A(k, ω) while tuning U / W
- hydrostatic pressure
- chemical composition
- alkali adsorption on layered crystals
  (charge transfer, CDW, intercalation, ...)


1T-TaS$_2$

- $\sqrt{13} \times \sqrt{13}$ CDW
- Mott–Hubbard gap
- Anderson localization

Spectroscopy during Rb deposition

Experiment:
ARPES @ “ESF”/BL7 @ ALS
hv = 96 eV (198.5 eV), T = 300 K

Tight-binding simulation

Rb deposition on 1T-TaS$_2$:
- Metal–insulator transition (Ta 5d)
  - Mott–Hubbard type + e–ph interaction
- Modification of CDW:
  - Wave vector: $\sqrt{13}$ a $\rightarrow$ $\sqrt{7}$ a (LEED)
  - Amplitude $\sim$ (Ta 4f splitting, Ta 5d kinks)
- Rb adsorption + intercalation (Rb 3d)

Effects on critical parameters:
- Band filling: n = 1 = const.
- Correlation energy: U = 0.8 eV = const.
- Bandwidth: $W_{\parallel}$ (1), $W_{\perp}$ (1)

Questions:
- Why change of CDW?
- Role of electron–phonon interaction?