

I Phonon mediated tunneling into TaS₂ (BETTER TITLE NEEDED)

I.1 Amplitude mode in TaS₂ charge density wave

The results

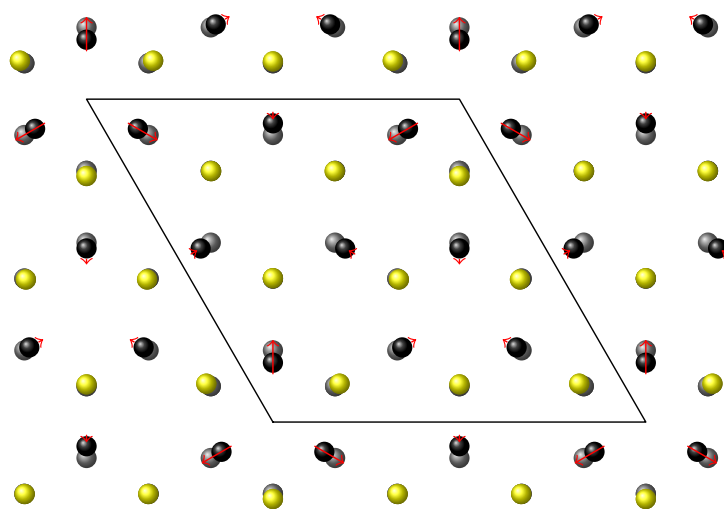


Figure I.1

I.2 Phonon mediated tunneling in Graphene

I.2.1 Scanning Tunneling Spectroscopy

Scanning Tunneling Spectroscopy (STS) is an experimental technique in which a Scanning Tunneling Microscope (STM) is used to map the density of states of a material.

Stipe et al. noted that the tunneling current in STS can also identify phonon modes of the material measured [1] (vibrational modes of a single molecule in this case).

introduction
stm/sts

I.2.2 Phonon mediated tunneling in Graphene

A gap feature around the fermi level in the measured DOS on graphene [2] was explained with electron-phonon interaction [3].

The underlying mechanism is that electrons can elastically tunnel into graphene at the Fermi level near the **K** point. This elastic process is suppressed because the wave function at the initial state i.e. the wave functions at the tip have a momentum distribution centered at $k_{||} = 0$, so the tunneling matrix element is suppressed for large k [4]. For electron energies larger than the energy

Graphic for that would be nice

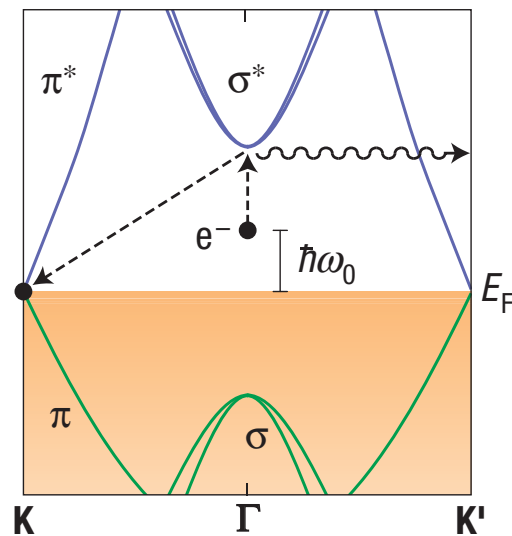


Figure I.2: Reprinted by permission from Nature Publishing Group: Nature Physics [2], copyright 2008

I.3 Phonon mediated tunneling into TaS₂

In a 2019 paper by Hall et al. [5], a similar gap feature with a width of $2\Delta = (32 \pm 9)$ meV was recorded in an STS measurement on TaS₂.

This gap is attributed to partial gapping to the formation of the charge density wave.

The density of states shown in fig. ?? shows no symmetric gap around the Fermi level.

explain cdw phase, gap due to peierls somewhere, reference here

woher kommt die genau? Quantum Espresso?

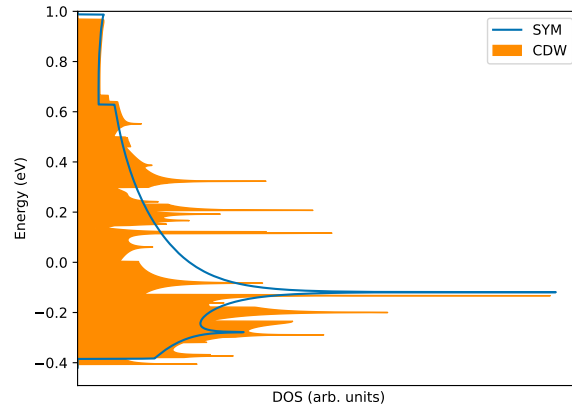


Figure I.3: Density of states for TaS₂ in the charge density wave (CDW) and undistorted (SYM) phase. The data was kindly provided by Dr. Jan Berges and has been calculated using the 2D tetrahedron method using 360^2 (1080^2) k points for the CDW (SYM) structure