

# I Phonon mediated tunneling into TaS<sub>2</sub> (BETTER TITLE NEEDED)

## I.1 Amplitude mode in TaS<sub>2</sub>

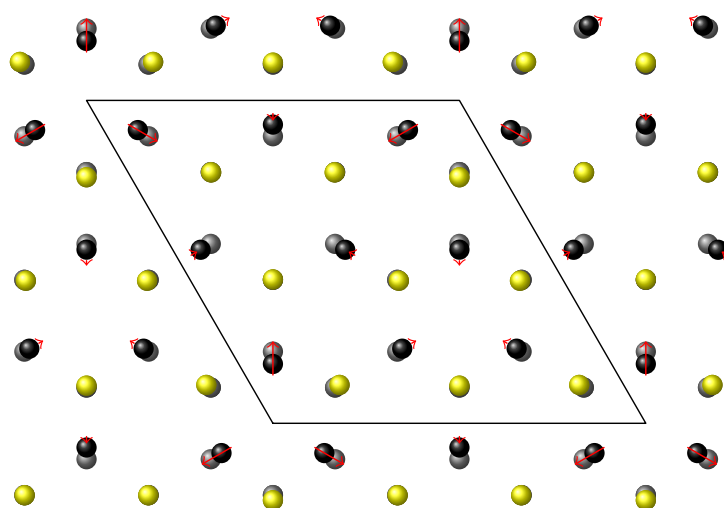


Figure I.1

## I.2 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.3 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].

Graphic for that would be nice

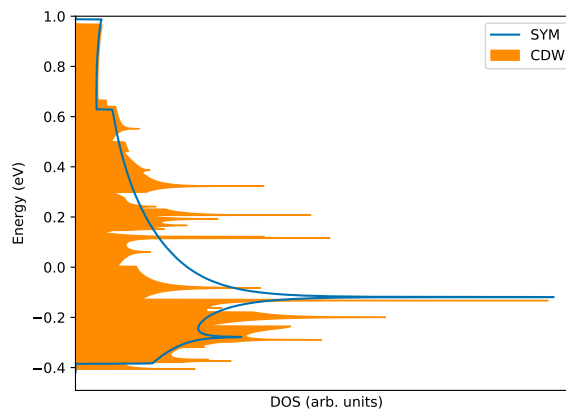
The underlying mechanism is that electrons can elastically tunnel into graphene at the Fermi level near the **K** point. This elastic process is suppressed because the wave function at the initial state i.e. the wave functions at the tip have a momentum distribution centered at  $k_{\parallel} = 0$ ,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

### I.4 Phonon mediated tunneling into TaS<sub>2</sub>

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 TaS<sub>2</sub>.

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

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



**Figure I.2:** Density of states for TaS<sub>2</sub> 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

woher kommt die genau? Quantum Espresso?

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