I Phonon mediated tunneling into TaS_2 (BETTER TITLE NEEDED)

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.

introduction stm/sts

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). Similarly, 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 $\boldsymbol{k}_{\parallel} = 0$, so the tunneling matrix element is suppressed for large $\boldsymbol{k}$ [4]. For electron energies larger than the energy

Graphic for that would be nice

In a 2019 paper by Hall et al. [5], a similar gap feature with a width of $2\Delta = (32 \pm 9)\,\mathrm{meV}$ was recorded in an STS measurement on TaS_2.

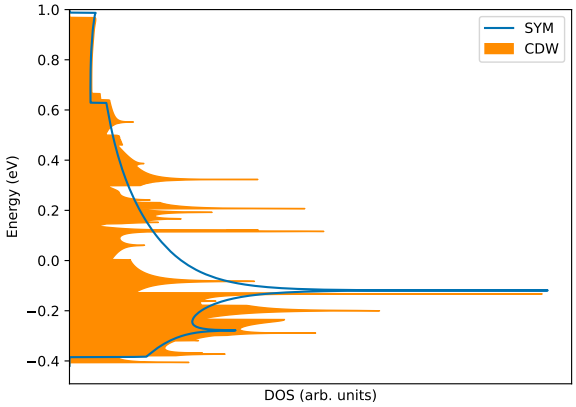

Figure I.1: *Density of states*