# Mott-metal proximity effect using 2D lateralinterfaces in 1T-1H-$TaSe_2$ monolayers

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Transition metal dichalcogenides (TMDs) are a great family of materials that exhibits a wealth of electronic properties. For instance, TMDs can be metallic as well as insulating or superconducting. They are also prone to exhibit charge density waves (CDW). $TaSe_2$ can be highlighted among TMDs. While 1H-$TaSe_2$ is metallic, 1T-$TaSe_2$ monolayer is known to be a Mott insulator.

We have focused our work on the $TaSe_2$ monolayer epitaxially grown on GaP(111) by MBE [1]. These samples provide us with a good playground for studying 2D lateral atomically sharp 1H-$TaSe_2$/1T-$TaSe_2$ interfaces thanks to the coexistence of both polytypes. Thanks to the semiconducting substrate, we were able to get intrinsic electronic properties of both phases by scanning tunneling microscopy and spectroscopy. This system enables us to compare our results with $TaSe_2$ monolayer grown on graphene [2].

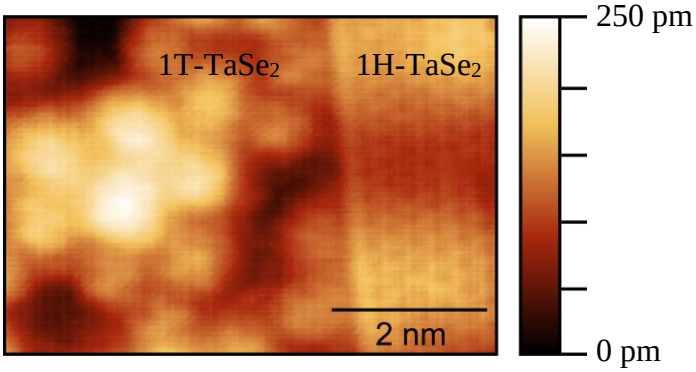


**Figure 1:** STM image at 4.5K of an interface between 1T-$TaSe_2$ (left) and 1H-$TaSe_2$ (right) domains. The larger pattern (~4nm) is coming from the Moiré.

In 2021, Zhang Q. et al. [3] have observed a collapse of the 1T-$NbSe_2$ phase in contact to the polytype 1H-$NbSe_2$. This interface hosts unusual electronic properties mixed between 1H-$NbSe_2$ phase and 1T-$NbSe_2$ that evokes proximity effect.

We have investigated such atomically sharp interfaces between 1T and 1H-$TaSe_2$ single domains (Fig 1.). We will present our measurements, emphasizing the similarities and differences and discuss the underlying physical mechanisms.

**References**

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