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Superconducting properties of highly-strained 3*R*-$TaSe_2$ epitaxial thin films

Transition metal dichalcogenides (TMDs) draw much attention because of their intriguing properties emerging at two-dimensional (2D) limit. Nowadays, some groups have succeeded in exfoliation of metallic TMDs such as $NbSe_2$ and TaS_2 down to a monolayer limit, unveiling new aspects of 2D physical properties. One remarkable example is unconventional superconductivity achieved by combination of large spin-orbit coupling and broken inversion symmetry, where spin-momentum-locked Cooper pairs play an important role in their superconducting states [1,2]. Another unique feature is the relationship between superconductivity and charge-density wave (CDW), which has been discussed both in $NbSe_2$ and TaS_2 exfoliated flakes. In this work, we focus on $TaSe_2$, which has been also known to have similar electronic structure and exhibit both superconductivity and CDW in its bulk form. There is one paper reporting electronic structure of monolayer $TaSe_2$ [3], but electrical transport properties of $TaSe_2$ ultrathin films have not been investigated so far. In this presentation, we report on fabrication of high-quality 3*R*-$TaSe_2$ thin films by molecular beam epitaxy, and show their transport properties with reduced dimensions.

References

[1] X. Xi *et al*., *Nat. Phys*. 12 (2016) 139-143
[2] S. C. de la Barrera *et al., Nat. Commun.* 9 (2018) 1427
[3] H. Ryu *et al., Nano Lett.* 18 (2018) 689-694

Figures

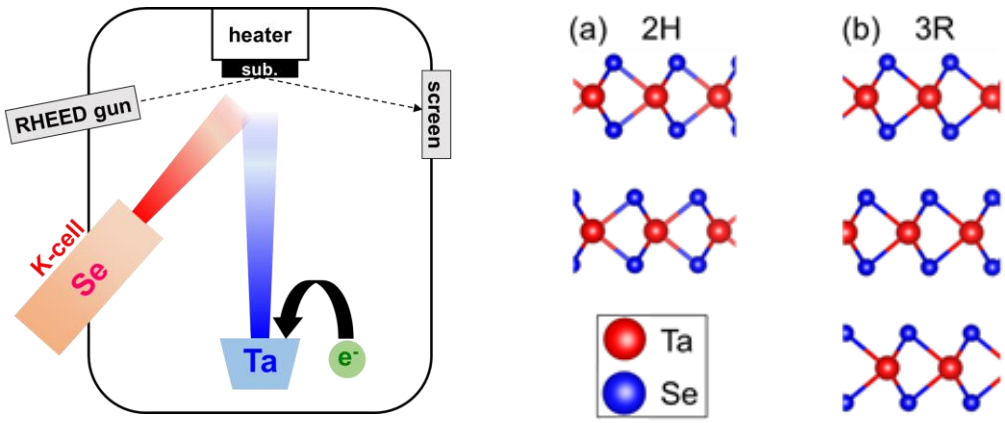

Figure 1: (Left) Schematic image of MBE (Right) (a)2*H* and (b)3*R* poly-types of $TaSe_2$