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1*T*′-$ReSe_2$: A new layered 2D semiconductor with in-plane polarization anisotropy

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Semiconductors and their nanostructures with an in-plane optical polarization anisotropy are potentially important for polarization-sensitive detection and optical computation (see [1] for GaAs and [2] for GaN quantum wells). Recently, a new family of two-dimensional layered semiconductors with a reduced crystal symmetry is emerging, with 1*T*′-ReS_2 and 1*T*′-$ReSe_2$ as its important members. Excitons in these materials exhibit strong in-plane polarization effects. In this talk, I will present our recent optical transmission and photoluminescence spectroscopy studies revealing the presence of strongly polarized excitons in the 1*T*′-$ReSe_2$ crystal plane. The polarization effects persist from bulk to monolayer crystals. We compare our results with *GW*-BSE *ab initio* calculations performed by the Rohlfing group.

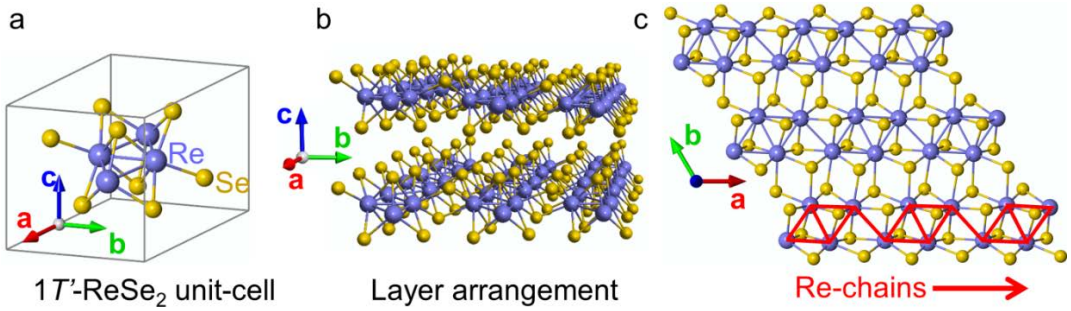

Figure 1 (a) Schematic representation of the 1*T*′-$ReSe_2$ unit cell, (b) Oblique view and (c) top view of the layer arrangement in the $ReSe_2$ crystal. Re-Re chains run along the a-direction in this crystal with a reduced symmetry.

References

[1] Arora, A. et al., Appl. Phys. Lett. 97, 081902 (2010).
[2] Arora, A. and Ghosh, S., J. Phys. D: Appl. Phys. 47, 045101 (2013).