

# Optical Properties of 2D Semiconductors

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Graphene is known as a prototypical two-dimensional material with unique physical properties. However, the difficulty of creating an optical band gap stimulated the search for other monolayer materials.

Layered transition metal dichalcogenides (TMDCs) serve as a promising new material class for opto-electronics. In contrast to conventional semiconductors such as GaAs, TMDC materials exhibit very strong excitonic effects. Excitons are bound electron hole pairs, which can be observed in the optical absorption spectra of TMDCs even at room temperature. In contrast to thicker crystals, TMDC monolayers of MoS<sub>2</sub>, WS<sub>2</sub>, MoSe<sub>2</sub>, and WSe<sub>2</sub> exhibit also prominent light emission (luminescence) at room temperature, which is important for building LEDs or LASERS, for example.

Furthermore, bright and stable single-photon emitters have been discovered in TMDCs [1], which renders atomically thin semiconductors also interesting for quantum optics and quantum technologies.

[1] S. Michaelis de Vasconcellos, D. Wigger, U. Wurstbauer, A. Holleitner, R. Bratschitsch, T. Kuhn, *phys. stat. sol. (b)* **259**, 2100566 (2022).