

Dear All,

We are pleased to announce the visit of Maciej Koperski from the Institute for Functional Intelligent Materials, National University of Singapore to MPSD.

Maciej will give a presentation on his work titled **"Electron tunnelling in vertical van der Waals junctions for electroluminescent devices"** at a seminar on

Thursday, March 12, at 14:00 CET in MPSD 900 EG 136.

The full abstract is provided below.

Electron tunnelling in vertical van der Waals junctions for electroluminescent devices.

The assembly of van der Waals heterostructures enables the creation of devices comprising materials with vastly different electronic band structures, overcoming the limitations of matching crystal structures. Sandwiching an insulator between two (semi-)metallic electrodes constitutes a blueprint for a rational design of tunnelling devices, where bidirectional injection of electrons and holes onto the radiative states leads to electroluminescent processes. The nature of the radiative states may be vastly different, including Wannier-Mott-like excitons in semiconductors [1,2], Frenkel excitons coupled to magnetization textures in ferromagnets [3,4], or intradefect transitions raising single photons [5-9]. The structure of the barrier can be complex, involving multiple materials with atomically precise thickness. Consequently, the efficiency of the electroluminescent processes is tunable across multiple orders of magnitude due to the competition between the tunnelling dynamics and the radiative lifetimes. Alternative tunnelling pathways are activated by distinct device architectures at the material level, governing their spectroscopic characteristics.

## *References*

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