Optical response of advanced materials: tunability and photonic applications

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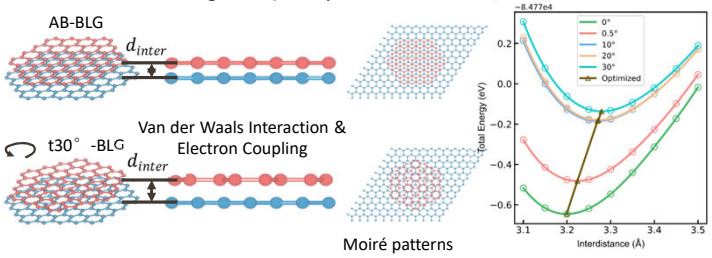
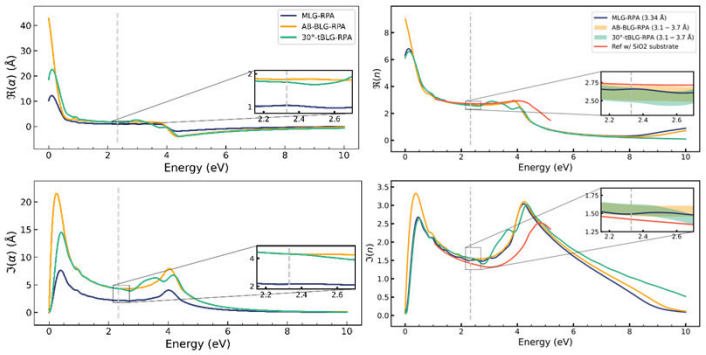
Optical response of 2D twisted bilayer graphene

Contributors: Helios Yongnan Li (heliosynl@connect.hku.hk)





$$\alpha_{2D}(\omega) = -\lim_{q\to 0}\frac{L}{4\pi q^2}\chi_{00}(\boldsymbol{q},\omega)$$

$\chi_{00}(\omega)$ with certain "thickness"

$$n(\omega) = \sqrt{\varepsilon(\omega)} = \sqrt{\chi_{00}(\omega)+1}$$

Defining "thickness" in 2D materials to predict measurable **refractive index**

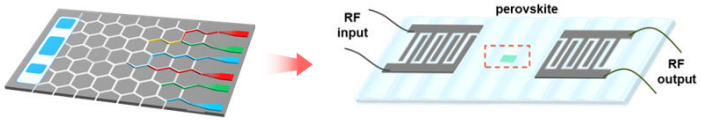
Supported by

Jockey Club Trust (GSP181)
RGC (STG3/E-704/23-N)
GBA Quantum Science Center (GDZX2304003)

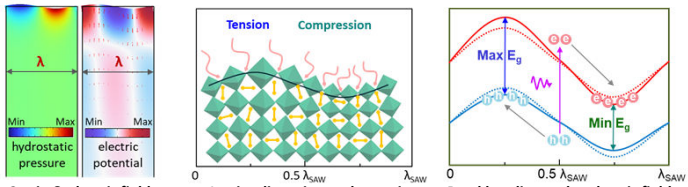
Optical modulation of 2D perovskite by SAW

Contributors: Pingping Zhang (ppzhang@connect.hku.hk)

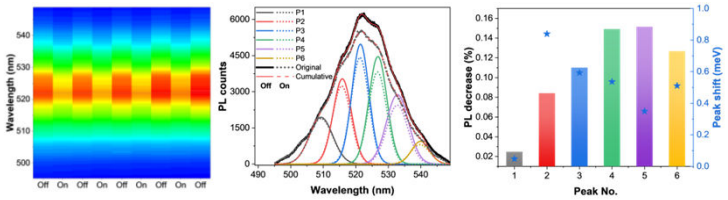
- Demands: Photonic integrated circuit (PIC) requires tunable optical sources
- Solution: combining 2D perovskite and surface acoustic wave (SAW)



- 2D perovskite: high-efficiency light source
- SAW: elastic wave propagating on the surface of piezoelectric solid (strain & electric field)



- Emission of 2D perovskite is modulated under SAW: intensity and wavelength



Energy transfer exploration in Mn^{2+} doped perovskite

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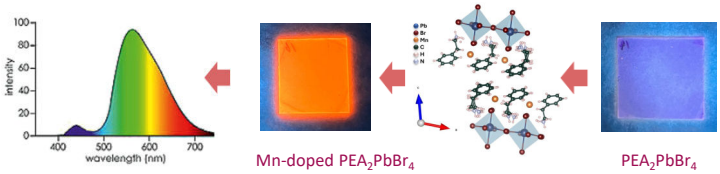


Exploration of electron transfer path for Mn^{2+} emission

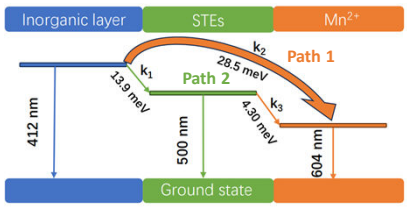
➢Path 1

Inorganic layer → Mn

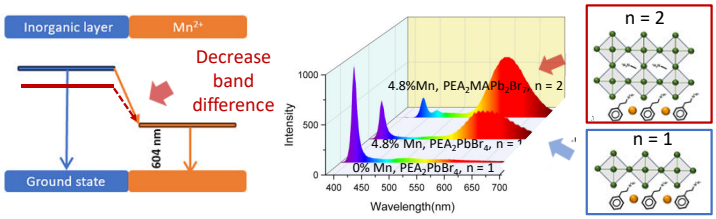
➢Path 2

Inorganic layer → STEs → Mn

Path 1 dominates at RT ($k_BT > \Delta E_a$)



Strategy for Mn^{2+} emission enhancement at RT: decrease energy gap for Path 1



Supported by Jockey Club Trust (GSP181)

Defect emission of 2D hBN by plasma bombardment

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