Hexagonal Boron Nitride - an Intriguing Platform For On Chip Quantum Technologies

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Engineering robust solid-state quantum systems is amongst the most pressing challenges to realize scalable quantum photonic circuitry. While several 3D systems (such as diamond or silicon carbide) have been thoroughly studied, solid state emitters in two dimensional (2D) materials are still in their infancy.

In this presentation I will discuss hexagonal boron nitride (hBN) as an emerging platform for integrated quantum photonics. In particular, I will focus on emerging ways to deterministically engineer quantum emitters in hBN and discuss their photophysical properties. I will also highlight scalable pathways for integration of these emitters with on chip optical and photonic resonators. I will conclude by discussing a new class of spin defects in hBN, that operate as quantum sensors and can be used at room temperature. Hosted by an atomically thin lattice, the new spin defects poised to revolutionise the field of quantum sensing, by enabling true atomic proximity between the sensor and the analyte.

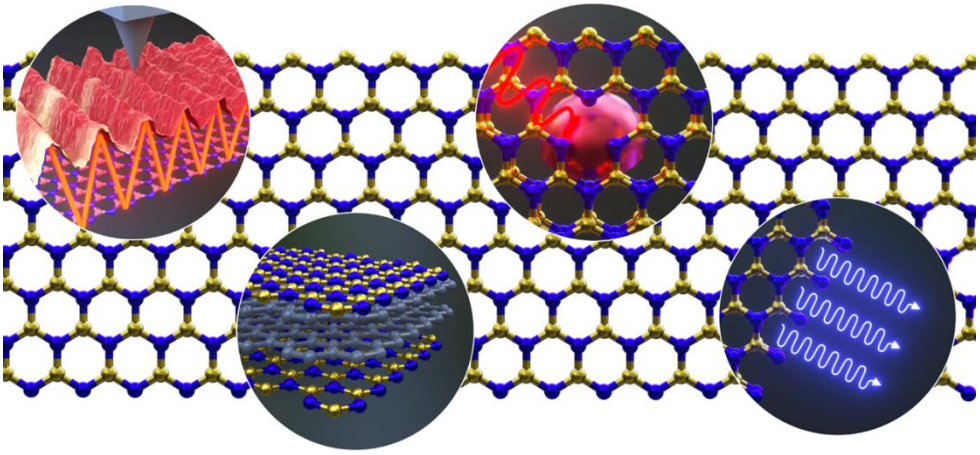

Figure 1. Schematic illustration of myriad applications of hBN quantum photonics – spanning UV LEDs, quantum emission, van der Waals heterostructures and single photon emission.