Quantum Technologies with Hexagonal Boron Nitride

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Engineering robust, solid-state quantum systems is amongst the most pressing challenges to realise scalable quantum photonic circuitry. In recent years, quantum emitters in hexagonal boron nitride (hBN) have emerged as fascinating candidates for realisation of room temperature quantum technologies with hBN.

In this presentation I will discuss the photophysical properties of quantum emitters in hBN and expand on their utility in scalable quantum technologies. I will focus on avenues to engineer these defects and describe their most promising properties – including their spin – photon interfaces. Integration of the emitters with photonic resonators is in the heart of achieving quantum circuitry on chip, and I will present our most recent attempts to achieve this goal. Taking advantage of the unique 2D nature of hBN, I will also show potential assembly of quantum optoelectronic devices and discuss potential on chip tunability of quantum emitters in hBN.

All in all, hBN possesses all the vital constituents to become the leading platform for integrated quantum photonics. To this extent, I will highlight the challenges and opportunities in engineering hBN quantum photonic devices and will frame it more broadly in the growing interest with 2D materials nanophotonics.