

Quantum Emitters in Flatland

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Engineering solid state quantum systems is amongst grand challenges in engineering quantum information processing systems. While several 3D systems (such as diamond, silicon carbide, zinc oxide) have been thoroughly studied, solid state emitters in two dimensional (2D) materials have not been observed. 2D materials are becoming major players in modern nanophotonics technologies and engineering quantum emitters in these systems is a vital goal. In this talk I will discuss the recently discovered single photon emitters in 2D hexagonal boron nitride (hBN). I will present several avenues to engineer these emitters in large exfoliated sheets using ion and electron beam techniques. Density functional theory calculations suggest that the studied defects are the antisite nitrogen vacancy in hBN. The formed emitters in 2D hBN flakes have extremely promising properties – including high brightness (~ millions counts/s), stability up to high temperatures and linear polarization at excitation and absorption. Those properties make these emitters extremely attractive for their integration with optical resonators and waveguides. Finally, I will discuss several challenges and promising directions in the field of quantum emitters and nanophotonics with 2D materials and other wide band gap materials.

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