Influence of electric fields on single photon emitters in hexagonal boron nitride

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The 2D material hexagonal Boron Nitride (hBN) was found to be a great candidate to host bright and stable single-photon emitters with a wide range of emission wavelengths [1]. These emitters are tunable by electric fields or strain where the former can be used to measure the Stark effect or to controllably charge and discharge emitter coupled to a charge reservoir in graphene [2,3]. This allows control over the emission of single photon emitters (SPEs) by using hBN-graphene heterostructures.
Here we perform photoluminescence measurements to investigate the influence of electric fields on SPEs in hBN created with gold nanopillars. We use a device structure consisting of a hBN flake with a graphene top gate deposited on a Si/SiO_2 substrate with gold nanopillars on top. We show the observation of single photon emission at different wavelengths and measure the influence of the electric field on the zero-phonon line of the emitter.
Furthermore, we investigate the influence of the graphene layer on the emission properties of the SPEs by adding a hBN capping layer that separates the emitter layer from the graphene gate to prevent quenching of emitters on the surface of the hBN emitter layer.
Our results pave the way for the integration of single photon emitters in hBN in graphene nanodevices [4,5] for quantum information technology.

References

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Figures

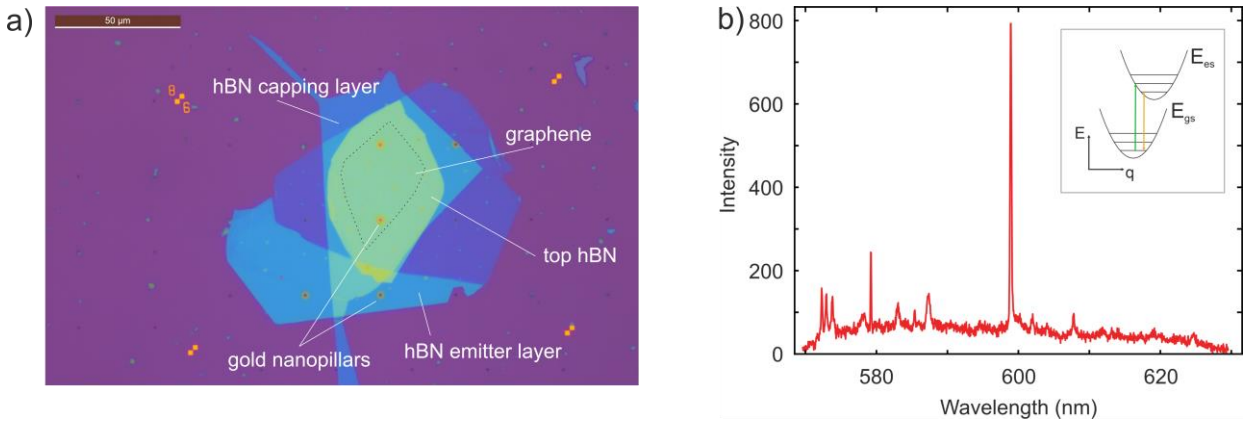

Figure 1: a) hBN-graphene heterostructure with hBN emitter and capping layer on 200 nm gold nanopillars. b) Spectrum of a single photon emitter in hBN. The excitation and emission of a single photon emitter is schematically shown in the inset.