Quantum emitters interfaced with 2D materials

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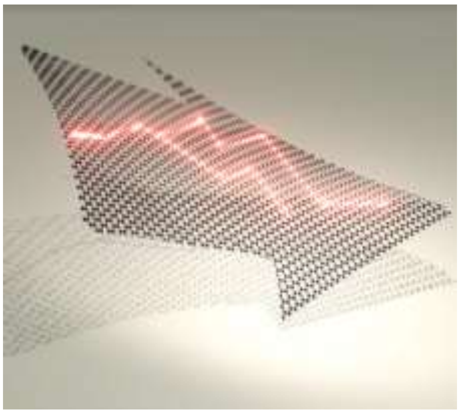

The field of two-dimensional (2D) materials-based nanophotonics has been growing at a rapid pace, triggered by the ability to design nanophotonic systems with in situ control, unprecedented number of degrees of freedom, and to build material heterostructures from the bottom up with atomic precision [1]. A wide palette of polaritonic classes have been identified, comprising ultraconfined optical fields, even approaching characteristic length-scales of a single atom. These advances have been a real boost for the emerging field of quantum nanophotonics, enabling quantum technologies harnessing single-photon generation, manipulation, and detection using 2D materials. In my talk, I will show several hybrid systems consisting in lifetime-limited single emitters [2, 3] (linewidth ~ 40 MHz) and 2D materials at sub-wavelength separation without degradation of the emission properties [4]. We have demonstrated that their nanoscale dimensions enable ultra-broadband tuning (tuning range > 400 GHz) and fast modulation (frequency ~ 100 MHz) of the emission energy [5], which renders it an integrated, ultra-compact tuneable SPS. I will also present recent results on unusual Stark tuning of ultra-narrow quantum emitter located at the edge of a graphene transistor. These results shed light on electronic noise and charge accumulations at graphene edges.

References

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