Droplet-etched GaAs/AlGaAs quantum dots for quantum photonics applications

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Semiconductor quantum dots (QDs) obtained by epitaxial growth are regarded as one of the most promising solid-state sources of triggered single and entangled photons for applications in emerging quantum technologies.

While most of the studies presented so far have mostly focused on InGaAs/GaAs QDs obtained by the Stranski-Krastanow (SK) growth mode, GaAs QDs in AlGaAs matrix have emerged as a promising alternative to SK QDs.

In this talk I will begin by briefly discussing the growth of GaAs QDs with highly symmetric shape [1] using two independent molecular beam epitaxy machines. I will then present recent results on the generation of polarization-entangled photons from such dots [2]. The good degree of indistinguishability of the emitted photons recently allowed us to perform two-photon interference experiments using two independent QDs [3]. For this experiment the emission energy of one of the QDs was finely tuned by piezoelectric-induced strain. Finally I will show that the addition of strain after growth allows us to substantially modify the nature of confined holes in a QD, which results in novel selection rules. In particular, uniaxial stress allows the quantization axis of the QD to be reoriented in the growth plane [4], a configuration particularly suitable for integrated quantum-photonics applications.

References

[1] Y. H. Huo, et al. Appl. Phys. Lett. **102**, 152105 (2013).
[2] D. Huber, et al. Nat. Commun. **8**, 15506 (2017).
[3] M. Reindl, et al. Nano Lett. 17, 4090 (2017).
[4] X. Yuan, et al. https://arxiv.org/abs/1710.03962.