GaSb-based quantum dot emitters for telecom wavelengths

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Solid-state single and entangled photon emitters linked coherently over long distances with optical fibers enable a new generation of quantum-based communications networks. Currently, epitaxial semiconductor quantum dots (QDs) pave the way as a scalable approach for fabricating deterministic non-classical light sources that can be integrated with other photonic or electronic components in miniaturized form. Here, we present a new quantum material system based on GaSb-based QDs formed by filling droplet-etched nanoholes [1,2], a technique which has been previously used for the state-of-the-art single- and entangled-photon sources in the GaAs-based materials emitting at wavelengths shorter than 800 nm [3-6].

This presentation covers the development steps and the current state-of-the-art of (In)GaSb QDs grown by filling droplet-etched nanoholes in AlGaSb. It is demonstrated that, while the GaSb QDs exhibit high homogeneity and small fine structure splitting similarly to their GaAs counterparts, they also enable single-photon emission in the 3rd telecom window [7] with prospects for extending towards 2µm. Furthermore, by employing quasi-resonant excitation or LO-phonon-assisted excitation of a single QD, it is possible to it is possible to achieve spectrally clean emission from a single exciton line and high-quality single-photon emission [8]. These properties make GaSb-based QDs ideal candidates for quantum photonic applications requiring compatibility with Si-photonics and fiber-based telecom.

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