Telecom wavelength single emitters in InP photonic structures for quantum communication

Mohamed Benyoucef

Affiliation1, 1Institute of Nanostructure Technologies and Analytics (INA), CINSaT, University of Kassel, Heinrich-Plett-Street 40, 34132 Kassel, Germany

Quantum dots (QDs), often referred to as artificial atoms, are emerging as a highly promising solid-state platform for photonic quantum technologies. In this contribution, we present our recent progress on telecom-wavelength InP-based QDs, addressing epitaxial growth, single-photon generation, device fabrication, and hybrid integration.

Single-photon sources operating at fiber-optic communication wavelengths are essential for long-distance quantum information transfer. Self-assembled semiconductor QDs embedded in microcavities and emitting in the telecom C-band, where silica fiber losses are minimal, represent a particularly attractive approach. We report on the development of low-density, highly symmetric QDs achieved through precise control of the epitaxial growth. Low-temperature micro-photoluminescence spectroscopy of individual QDs reveals sharp excitonic emission lines with negligible fine-structure splitting, highlighting their suitability for entangled photon generation. These InP-based QDs demonstrate bright and highly pure single-photon emission across a broad spectral range within the third telecom window. In addition, we discuss the hybrid integration of InP-based single-photon sources onto silicon photonic chips and fibres.