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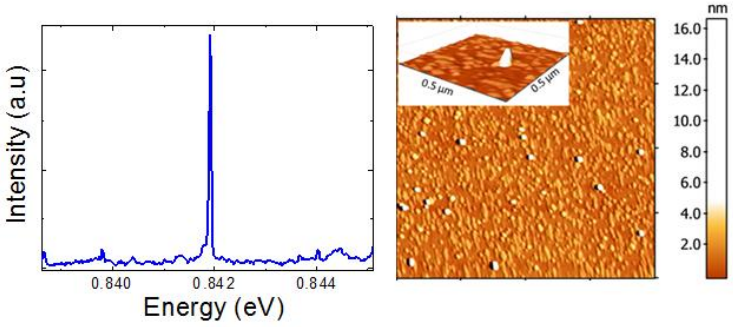
Master thesis

Single quantum dots emitting at telecom wavelengths for secure quantum information

Semiconductor quantum dots (QDs) are small nano-objects which are surrounded by higher band gap semiconductor material. Because of their size they confine carriers in three dimensions having discreet energy levels like atoms, which are often referred as artificial atoms. Due to their unique optical and mechanical properties, QDs can be used as building blocks for quantum information processing such as single-photon emitters. However, for this application circular and low density QDs operating in the telecom wavelengths (around 1.55 µm) should be realized. InP QD based materials is one of the possible candidates to achieve this goal due to low lattice mismatch with InAs QD material. Nevertheless the complex self-organization behavior of InAs QDs on InP system is not yet completely understood.

For more information see the following articles:

- Appl. Phys. Lett.104, 022113 (2014),
- Appl. Phys. Lett.103, 162101 (2013)



Tasks:

- Molecular beam epitaxy growth of low density InAs QDs emitting at 1.55 µm by systematically varying different parameters such as substrate temperature, V/III ratio, QD material coverage and annealing time.
- Morphological characterizations of QDs by AFM in the clean room.
- Optical characterizations of the grown single InAs QDs and InAs QDs embedded in photonic crystal by low temperature micro-photoluminescence (µ-PL).

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