Seminarankündigung

Dienstag, 20. November 2012
17:15 Uhr

ZNN, Seminarraum EG 0.001

“Site-controlled quantum dots for nanophotonic applications ”

SCQDs provide a platform for the scalable fabrication of systems containing a single, spatially resonant semiconductor quantum emitter and a microcavity, which is, to date, a challenging task in nano-engineering. Such coupled nanophotonic systems can be exploited as single photon sources or nano-lasers. In order to realize ordered InAs QDs on GaAs surfaces, the sample surfaces were pre-patterned with shallow nanoholes via a combination of electron beam lithography and wet chemical etching. The nucleation of QDs is directed by a combination of preferential QD nucleation on a textured surface and vertical strain coupling, resulting in well-ordered SCQD arrays with periods comparable to microresonator dimensions. The technology of positioning single QDs by means of pre-patterning a crystal surface can also be transferred to the GaInP/InP QD material system. In contrast to the In(Ga)As QDs, emitting in the spectral range ~900-1200 nm, the emission of the InP QDs is blueshifted by ~200 nm into a spectral region where highly sensitive single photon detectors have a notably higher efficiency. The optical properties of our positioned quantum emitters are investigated by means of photoluminescence, electroluminescence and photon correlation techniques. In order to probe the spatial ordering of optically active, buried QDs, we apply low temperature cathodoluminescence (CL) spectroscopy using a modified scanning electron microscope. Some examples of coupled resonator systems with integrated positioned QDs are additionally discussed, in order to demonstrate the capability to scalably realize single QD-resonator systems with our approach.

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