HL 1 Hauptvortrag Schmidt

Zeit: Freitag 10:00–10:45 Raum: TU P270

Hauptvortrag

HL 1.1 Fr 10:00 TU P270

One-, two-, and three-dimensional quantum dot crystals — •Oliver G. Schmidt — Max-Planck-Institut für Festkörperforschung, Heisenbergstr. 1, D-70569 Stuttgart, Germany

Over the last decade self-assembled semiconductor quantum dots (QDs) have become a major research field in materials science, physics and technology. The rapid progress is driven by the recent demonstration of several front end single quantum dot devices, which are envisioned to form the base of a future quantum information technology. The road, however, is long and it is foreseeable that the full advantage of QDs can only be deployed if a controlled positioning and high integration of these nanostructures on a single chip can be realized.

In this talk I report on the fabrication of one-, two-, and three dimensional QD crystals, which are seeded by lithographically defined surface patterns. Such seeded QD crystals experience a high structural integrity both on a short as well as on a long-range scale. Many novel phenomena are revealed such as the occurrence of lateral strain field interferences, lateral QD replication during layer stacking, or the formation of periodic second order QD arrays.

In analogy to crystal defects, we develop the notion of QD defects, which can occur during the growth of a QD crystal. Such QD defects include QD vacancies and interstitials, which develop if the growth conditions do not perfectly match the seeding layer geometry. We try to understand our experimental results by kinetic Monte Carlo simulations that take into account realistic growth conditions, strain fields and surface curvatures.