Stuttgarter Physikalisches Kolloquium

Max-Planck-Institut für Festkörperforschung
Max-Planck-Institut für Intelligente Systeme
Fachbereich Physik, Universität Stuttgart

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Single exciton manipulation in gate-defined quantum traps

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Abstract

Gate-controlled electrostatic potential landscapes imposed on quantum wells enable manipulation of excitons in energy, lifetime, position and density. Reversible ionization of excitons is demonstrated to allow temporary image storage and manipulation. On double quantum wells traps can be realized which confine long-living spatially indirect dipolar excitons. They enable to study the transition from confined multi exciton ensembles, potential candidates for Bose-Einstein condensation, down to a single, electrostatically trapped dipolar exciton. At low temperatures and in the few exciton regime, discrete emission lines are observed and identified as resulting from a single exciton, a bi-exciton and a tri-exciton, respectively. Their energetic spacing is well described by Wigner-like molecular structures reflecting the interplay of dipolar interexcitonic repulsion and spatial quantization.