High quality factor GaAs microcavity with buried bullseye defects

The development of high quality factor solid-state microcavities with low mode volumes has paved the way towards on-chip cavity quantum electrodynamics experiments and the development of high-performance nanophotonic devices. Here, we report on the implementation of a new kind of solid-state vertical microcavity, which allows for confinement of the electromagnetic field in the lateral direction without deep etching. The confinement originates from a local elongation of the cavity layer imprinted in a shallow etch and epitaxial overgrowth technique. We show that it is possible to improve the quality factor of such microcavities by a specific in-plane bullseye geometry consisting of a set of concentric rings with subwavelength dimensions. This design results in a smooth effective lateral photonic potential and therefore in a reduction of lateral scattering losses, which makes it highly appealing for experiments in the framework of exciton-polariton physics demanding tight spatial confinement.