Suppression of the leaky mode emission of quantum dots in micropillar cavities with radial Bragg reflectors

T. Jakubczyk*[1,2], H. Franke[3], T. Smoleński[1], M. Ściesiek[1], W. Pacuski[1,2], A. Golnik[1], R. Schmidt-Grund[3], M. Grundmann[3], C. Kruse[2], D. Hommel[2], P. Kossacki[1]

[1] Institute of Experimental Physics, Faculty of Physics, University of Warsaw, Pasteura 5, 02-093 Warsaw, Poland,
[2] Institute of Solid State Physics, University of Bremen, P.O. Box 330440, 28334 Bremen, Germany,
[3] Universität Leipzig, Institut für Experimentelle Physik II, Linnestr. 5, 04103 Leipzig, Germany

Mailing address: Tomasz.Jakubczyk@fuw.edu.pl
* Corresponding Author

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Abstract

Micropillar cavities combine both high photon extraction efficiency and the ability to confine light in small volume at the emitters site. We present improvement in the photonic confinement in micropillars by implementation of an additional radial concentric Bragg reflector [1]. Such a radial Bragg reflector increases the reflectivity in all directions perpendicular to the micropillar axis from a typical value of 15-30% to above 98%. An inhibition of the spontaneous emission of off-resonant excitonic states of quantum dots embedded in the microcavity is evidenced by time-resolved experiments [2]. It proves a decreased density of photonic states for off-resonant photon energies and a reduction of unwanted leakage of photons out of the micropillar. For on-resonance conditions, we find that the dot emission rate is increased, as in standard micropillar cavities. The proposed design can increase the efficiency of single photon sources and bring new functionalities of micropillar cavities which base on elongated decay times.

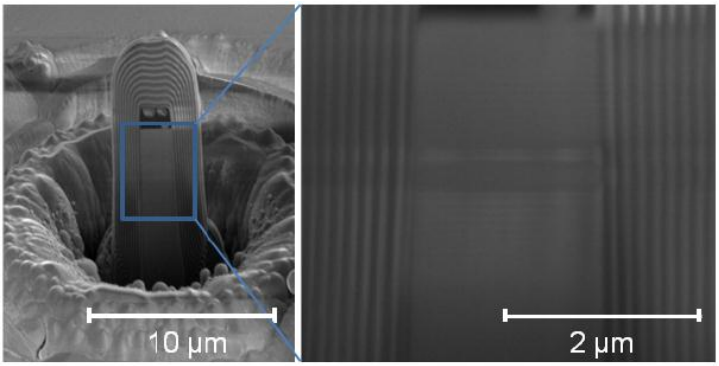

Figure 1: Cross-section of a micropillar with lateral Bragg reflector.

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