High-*Q* cavities design in photonic crystal slab heterostructures

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The highest *Q* values that have been reported to date in photonic crystal slab (PCS) were achieved in double-heterostructures [1]. We show here that ultrahigh-*Q* cavities can be designed in PCS heterostructures without change of the structural geometry: we consider heterostructures composed of elements that differ in the refractive index; and this index difference can be easily photoinduced in chalcogenide- or polymer-based PCS. We demonstrate numerically that chalcogenide-based PCS heterostructures, designed in this way, can reach quality factors of $Q \sim 1\times10^6$ [2].
We also design high-*Q* novel heterostructures changing the refractive index within the holes in the central part of the homogenous structure. For example the air in the holes of the central part of PCS can be replaced with material of the higher refractive index. We consider materials having refractive index in the range n=1.1-1.7, such as liquid crystal, polymer or nano-porous silica and obtain high-*Q* cavities [3]. Both approaches open the possibility of post-processing of PCS-based microcavities.

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2. S. Tomljenovic-Hanic, M. J. Steel, C. M. de Sterke and D. J. Moss, *Opt. Lett*., in press.
3. S. Tomljenovic-Hanic, C. M. de Sterke and M. J. Steel, *Opt. Express* **14**, 12451, (2006).