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Tesis: "PHOTONIC CRYSTAL NANOBEAM CAVITIES FOR 2D EMITTERS"

Resumen:

In the area of photonics, photonic crystals are of great interest since they possess photonic band gaps. Therefore, the crystals are also known as photonic bang gap materials. The photonic band gaps of these materials are the key property which enables the design and fabrication of devices capable of controlling light propagation and light confinement: mirrors, waveguides, cavities, filters, and optical isolators. Furthermore, the manipulation of light that photonic crystals grant, can also be exploited in other areas of research such as: chemical sensing, biomedics, gas sensing, solar cells and communications. Among the devices previously mentioned, photonic crystal nanobeam cavities have proven to be the best resonator choice for integrated optics. Since these cavities are capable of providing large Purcell factors, thanks to their achievable high-quality factors (Q) and small mode volumes. For the purpose of latter integration with single photons emitters, in the present work a 1-D deterministic photonic crystal nanocavity design, with high in-line coupling to a waveguide, is investigated and used to fabricated two nanobeam cavities on $Si3N4 - on - SiO2$ platform for two different operational wavelengths: 890 nm and 646 nm. The photonic crystal nanobeam cavities were optimized through finite difference time domain (FDTD) simulations and later were fabricated via combination of electron beam lithography and dry etching technology. The cavities fabricated in this work exhibited quality factors on the range of 1000 to 10000 and mode volumes as small as 0.63image.png and 0.94 image.png .and 0.94