InGaAs/GaAs/InGaP quantum well microcavities with spatially controlled carrier injection

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Microdisk optical cavities are of great interest in optoelectronics. Also, they are employed as a tool for the investigation of open cavity quantum electrodynamics. Recently, there has been an interest in optical cavities with boundaries based on chaotic billiards, where the semi-classical limit is achieved for cavity dimensions much greater than the wavelength of light in the semiconductor medium. An enhancement in light directionality is proposed for such structures [1]. Nevertheless, the cavity eigenmodes and their interaction with the semiconductor medium is not well understood.

InGaAs/GaAs quantum well structures embedded in InGaP optical confining layers are suitable for the fabrication of microcavity structures since highly selective wet etching between GaAs/InGaP layers is available. Light ion irradiation, such as in He^+ implantation has been shown to provide highly resistive layers without optical damage to InGaP material, being suitable for changing the carrier injection geometry in these devices [2].

In this work, we present our recent development of microcavities based on InGaAs/GaAs/InGaP quantum well structures. After optimizing processing conditions, we examine spectral and light versus pump behavior in microcavities based on disk, ellipse and gymnasium boundaries. Finally, we present the results of micro-cavities with carrier injection geometry defined by light He^+ implantation. Particularly, we are improving the overlap between injected carriers and classical *scars* [3] of the electromagnetic field spatial distribution.

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