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DESIGN AND FABRICATION OF SUSPENDED WAVEGUIDES WITH PHOTONIC GRATING STRUCTURES

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Abstract

In this dissertation a fabrication process is developed to reliably create suspended waveguides with optical grating features. Two potential applications for suspended waveguides with optical gratings are described, evanescent field sensors and stimulated Brillouin scattering lasers, along with procedures for design and fabrication of the devices. Development the of fabrication process is described in detail, to explain each choice of material and fabrication method. The optimized fabrication process is presented along with the full parameters and fabrication techniques used. Suspended optical gratings are fabricated successfully using this method, reliably creating suspensions of up to 1mm in length, ranging from 1um to 5um in width, and 400-450nm thick. The waveguides are optically characterized, revealing significant spectral features as a result of optically induced defects on the waveguides. These defects and their effects are thoroughly characterized through numerical modeling. Two methods to bypass the issues caused by these defects are presented: increased lithography resolution to create single mode or defect free waveguides, or the use of a high index cladding layer to force even large scale waveguides into single mode operation. Time resolved transmission measurements, using the defects to create stochastic spectral features, are completed as a proof of concept for these structures use as evanescent field sensors.

All are welcome to attend