

Cavity-resonator-integrated guided-mode resonance filter in channel waveguide

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Abstract: A cavity-resonator-integrated guided-mode resonance filter (CRIGF) consisting of a grating coupler and a pair of distributed Bragg reflectors in a channel waveguide is proposed for a narrow-band reflection spectrum with a small aperture. A channel waveguide structure and grating pattern of the device were simultaneously formed by the electron-beam direct-writing lithography. A full-width at half-maximum of reflection spectrum of the fabricated CRIGF was about 0.3 nm with the maximum reflectance of about 30%. A reflection phase varied by almost 2π for wavelength change of 1 nm.

Keywords: wavelength filters, optical waveguides, grating couplers, guided-mode resonance, distributed Bragg reflectors, waveguide resonators

Classification: Optoelectronics, Lasers and quantum electronics, Ultrafast optics, Silicon photonics, Planar lightwave circuits

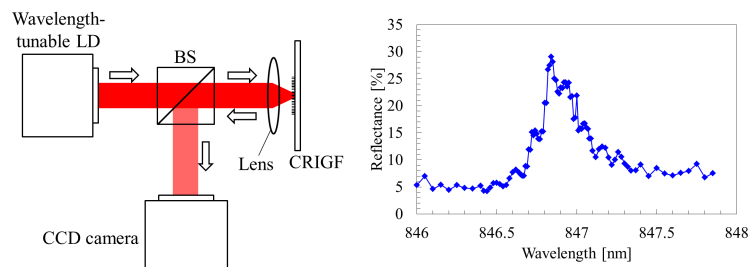


Fig. 6. Experimental setup for measuring a reflection spectrum of fabricated CRIGF.

Fig. 7. Measured reflection spectrum of fabricated CRIGF.

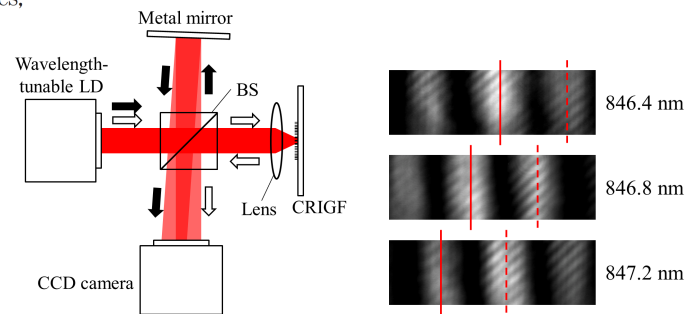


Fig. 8. Experimental setup for measuring a reflection phase variation of fabricated CRIGF.

Fig. 9. Observed interference fringes.

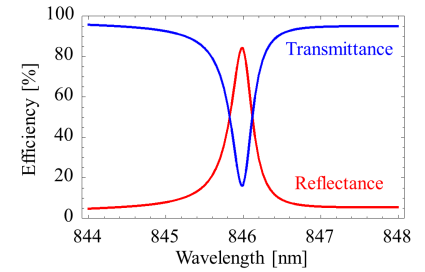


Fig. 4. Reflection and transmission spectra predicted by analysis model based on the coupled-mode theory.

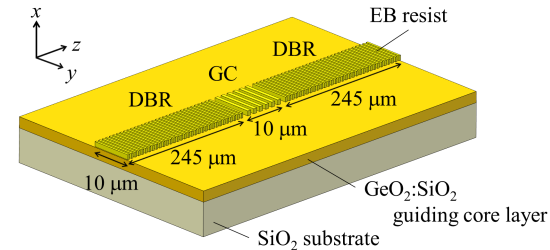


Fig. 2. Schematic perspective view of CRIGF in channel waveguide.

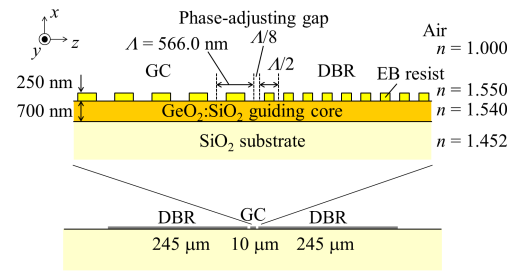


Fig. 3. Cross-sectional structure of the designed CRIGF.

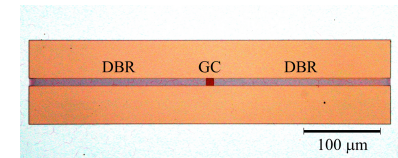


Fig. 5. (a) Optical microscope photograph and (b) scanning electron microscope image of the fabricated CRIGF.

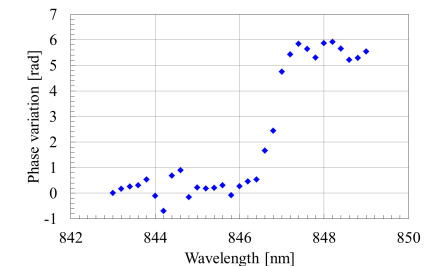


Fig. 10. Measured reflection phase variations of fabricated CRIGF.

resonator-integrated -mode resonance channel waveguide

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