Reflection characteristics of guided-mode resonance filter combined with bottom mirror

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A new type of mirror, based on guided-mode resonance, was proposed and discussed to provide a mirror having high reflectance and large wavelength dependence of reflection phase variation. The proposed mirror consists of a surface grating integrated in a channel waveguide on a high-reflection layer. A SiO_2-based device was fabricated for 0.85-μm wavelength operation, and reflection phase variation of almost π, with wavelength change of sub-nanometers, was confirmed experimentally.

OCIS codes: (050.6624) Subwavelength structures; (050.2770) Gratings; (130.2755) Glass waveguides; (130.2790) Guided waves; (230.4040) Mirrors.

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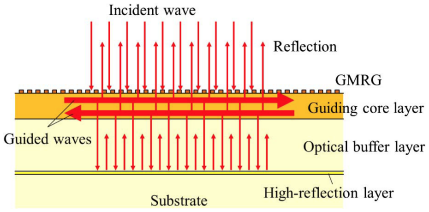


Fig. 1. Schematic cross section of the proposed device.

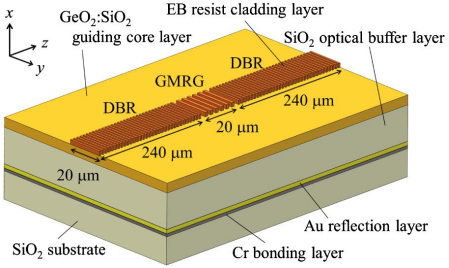


Fig. 2. Schematic perspective view of fabricated devices.

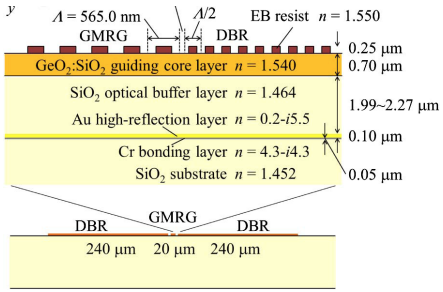


Fig. 3. Schematic cross section of fabricated devices.

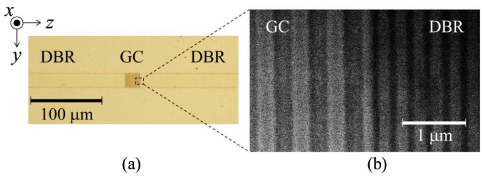


Fig. 4. (a) Optical microscope photograph and (b) scanning electron microscope image of the fabricated device.

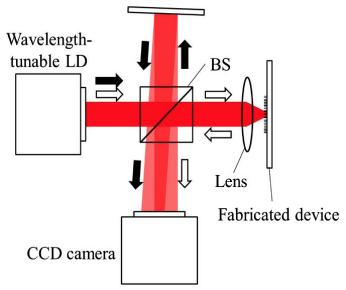


Fig. 6. Experimental setup for measuring reflection-phase variation.

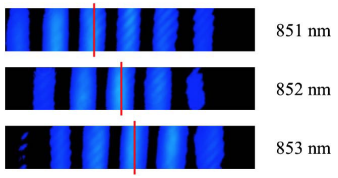
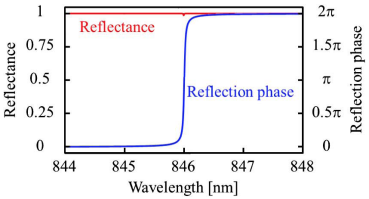
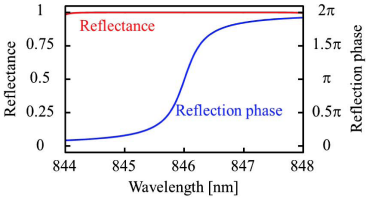


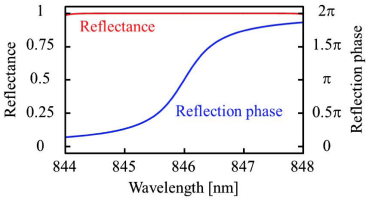
Fig. 7. Interference fringes obtained for device with buffer layer thickness of 1.99 μm.



(a) Buffer layer thickness is 2.05 μm



(b) Buffer layer thickness is 2.10 μm



(c) Buffer layer thickness is 2.15 μm

Fig. 5. Calculated wavelength dependences of reflectance and reflection phase. (a) Buffer layer thickness is 2.05 μm. (b) Buffer layer thickness is 2.10 μm. (c) Buffer layer thickness is 2.15 μm.

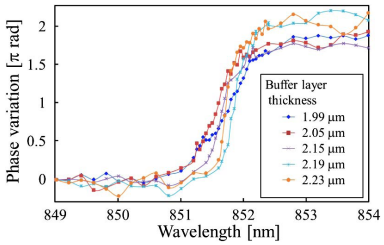


Fig. 8. Wavelength dependences of reflection phase of fabricated device.