

Cavity-Resonator-Integrated Guided-Mode Resonance Filter with Nonuniform Grating Coupler for Efficient Coupling with Gaussian Beam

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A cavity-resonator-integrated guided-mode resonance filter (CRIGF) has been proposed and investigated for providing a high-efficiency narrowband reflection with a small aperture. The CRIGF consists of a grating coupler (GC) and a pair of distributed Bragg reflectors (DBRs) constructing a waveguide cavity resonator. This time, a GC with nonuniform fill factors was integrated in a channel waveguide resonator in order to realize efficient coupling with an incident Gaussian beam of about 10 μm diameter. The improvement of reflection efficiency was confirmed by numerical simulations as well as experimental results with the fabricated device for 1.55- μm -band operation.

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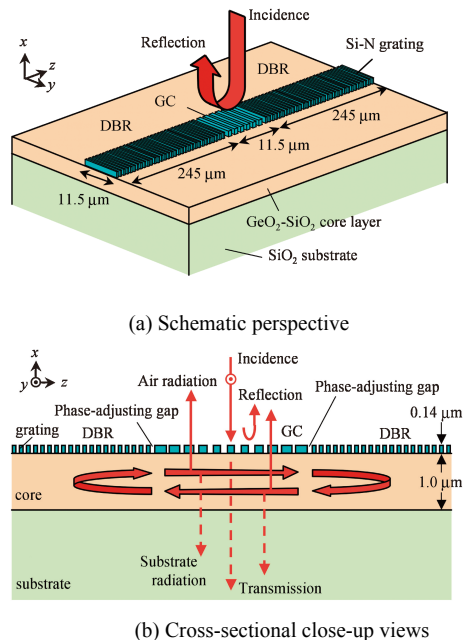


Fig. 1. Designed CRIGF with nonuniform GC integrated in a channel waveguide.

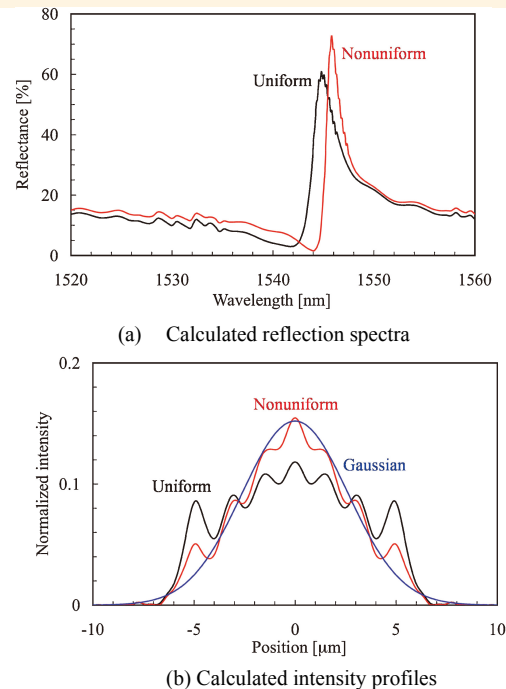


Fig. 2. Reflection waves of the designed CRIGFs with uniform and nonuniform GCs.

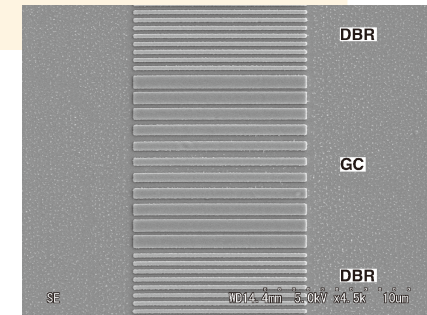


Fig. 3. SEM photograph of the center part of CRIGF pattern with the nonuniform GC in the resist.

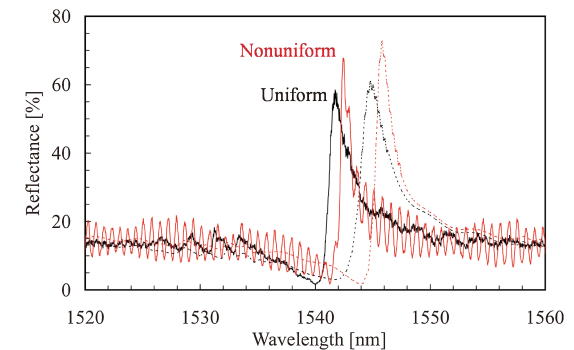


Fig. 5. Measured reflectance spectra of the fabricated CRIGFs with nonuniform and uniform GCs. The calculation spectra are also shown by dotted curves, which are identical to those shown in Fig. 2(a).