

Cavity-resonator-integrated grating input/output coupler for high-efficiency vertical coupling with a small aperture

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A cavity-resonator-integrated grating input/output coupler (CRIGIC) is designed to operate at about 850 nm wavelength for high-efficiency vertical coupling of a guided wave and a free-space wave with a small aperture. The CRIGIC consists of a grating coupler and a waveguide cavity resonator constructed by two distributed Bragg reflectors. A coupling efficiency of 96% with a 3 dB bandwidth of 1.2 nm is predicted by a theoretical calculation. An output coupling efficiency of about 60% is experimentally demonstrated on a 20 μm aperture device, fabricated in a thin-film SiO_2 -based waveguide on a substrate with an Au reflection layer, for what we believe to be the first time. © 2010 Optical Society of America

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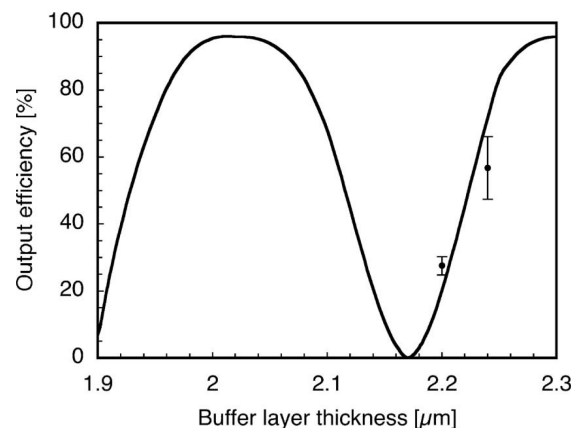


Fig. 2. Dependence of the output coupling efficiency on the buffer thickness. The curve and closed circles denote the theoretical and measured values, respectively.

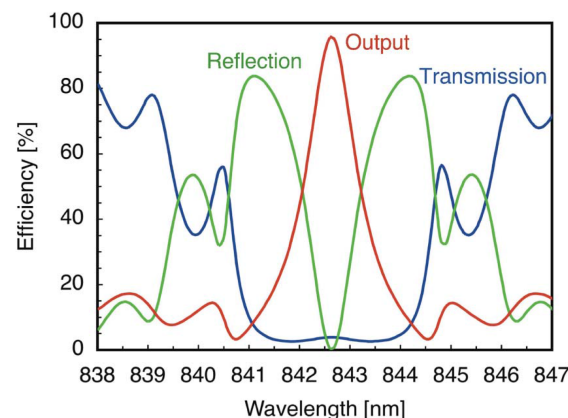


Fig. 3. (Color online) Theoretically calculated wavelength dependence of output, transmission, and reflection efficiencies of the designed CRIGIC.

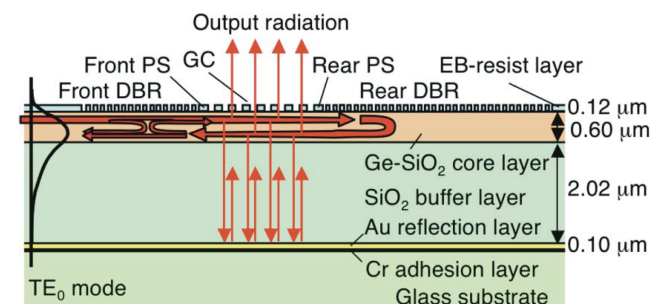


Fig. 1. (Color online) Cross-sectional structure of the designed CRIGIC.

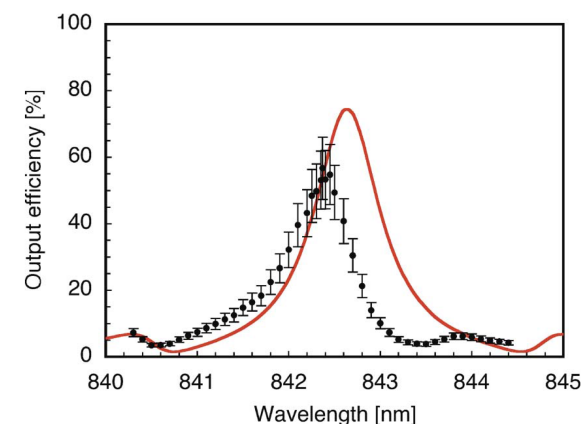


Fig. 4. (Color online) Measured (closed circles) and theoretical (solid curve) wavelength dependence of output efficiency of the fabricated device.