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Nanoplasmonic band-stop filter with flat and wide notch by using a single rectangular ring resonator

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We systematically investigate and numerically demonstrate a novel nanoplasmonic filter with flat stopband and wide bandwidth by using a single rectangular ring resonator. This device consists of a single rectangular ring directly connected to the input and output waveguides. In conventional ring resonator, light in each resonator propagates in either the clockwise or counterclockwise direction. Here, the wave propagating in the waveguides excites both clockwise and counterclockwise traveling-wave modes inside the rectangular ring resonator owing to direct connection between the input/output waveguides and this resonator. Then, this device can be equivalent to a coupled double-ring resonator and can be functioned as a second-order integrated optical filter. The equivalent circuit model based on the well-known analogy between metal-dielectric-metal waveguides and microwave transmission lines is applied to analyze the filter characteristics of this device. The analytical expressions for the transmittance and reflection of this device are derived, and then the relative position between the input and output waveguides is easily realized without iterative optimization. The calculated results obtained by this model are in close agreement with simulated ones carried out by the two–dimensional finite-difference time domain method. A flat band-stop optical filter with the dimension of 200x558.5 nm^2 and the bandwidth of 970 nm at the center wavelength of 1550 nm are attained. The stopband response and the bandwidth can be manipulated by varying the width of the ring resonator.

Biography

Yuhsin Chang received M.S. degree in Electrical Engineering from National Chiao-Tung University, Taiwan, in 2010. She is currently working toward the Ph.D. degree at the Integrated Photonics Laboratory, Department of Photonic and Institute of Electro-Optical Engineering, National Chiao-Tung University, Taiwan. Her research interests are the field of the guided-wave optics, including the optical fibers and optical waveguides. She has presented several posters and published several papers at International Conference on Optics and Photonics in Taiwan. Her current research interests focus on the plasmonic devices design.

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