

Photonic Crystal Optical Modulator



Summary of Content

Photonic crystal optical modulators use engineered periodic structures to control light propagation, enabling high-speed, low-voltage modulation for integrated photonics and optical communication.

Working Principle

Photonic crystal (PhC) modulators exploit the periodic dielectric structure of photonic crystals to create resonant cavities or waveguides that strongly confine light. Modulation is achieved by changing the effective refractive index of the PhC, which shifts the resonant frequency and alters the transmission of the optical signal. This can be done using electro-optic effects, where an applied electric field modifies the refractive index of the material within the cavity or waveguide. In nanobeam PhC modulators, the electric field is applied across doped silicon arms or electro-optically active polymers, and simulations using CHARGE and FDTD methods predict the resulting changes in refractive index and optical transmission. The modulation efficiency depends on the electro-optic coefficient of the material and the geometry of the photonic crystal.

Design and Fabrication

Article Content

Photonic Crystal Waveguide Electro-Optic Modulator With a Wide ...

For high-speed modulation, a photonic crystal (PhC) waveguide modulator using a ferroelectric thin film has been

Mid-infrared optical modulator based on silicon D-shaped photonic ...

In this work, an optical mid-IR modulator based on silicon D-shaped PCF (Si-D-PCF) with vanadium dioxide (VO₂) as a phase

Optical mid-infrared modulator based on D-shaped photonic crystal

PCF is a class of optical fiber based on the properties of photonic crystals. They are periodic microstructures based

Wide Spectral Characteristics of Si Photonic Crystal Mach ...

Optical modulators for optical interconnects require a small size, small voltage, high speed and wide working spectrum.

AI-enhanced inverse design of photonic crystal fiber optical modulator ...

The framework is applied to optimize a silicon-based D-shaped photonic crystal fiber optical modulator (PCF-OM)

Ultra-Compact and Ultra-High Speed Topological

By leveraging the topological photonic crystal (TPhC) structure, a better optical confinement

Silicon Photonic Crystal Modulators for High-Speed Transmission and ...

Abstract: For next-era optical interconnects in data centers, development of compact, energy-efficient, low-cost, and

Lithium niobate photonic-crystal electro-optic modulator

Recently, thin-film lithium niobate (LN) emerges as a promising platform for photonic integrated circuits. Here, we

Ultra-Compact and Ultra-High Speed Topological Photonic Crystal ...

By leveraging the topological photonic crystal (TPhC) structure, a better optical confinement is achieved, and the

(PDF) Electro-optical modulator based on photonic crystals on ...

We report on the design and the realization of an electro-optic modulator based on photonic crystals in a thin film

Nanobeam photonic crystal modulator

In this example, we will characterize the performance of a nanobeam photonic crystal (PC) electro-optic modulator using CHARGE

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