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One-by-One Multimode Interferometer Filter on Thin-Film Lithium Niobate

Multi-mode interferometers (MMIs) are used as optical couplers in integrated photonic devices with applications in areas such as optical switching, astrophotonics and quantum information. We propose and demonstrate a one-by-one (1x1) MMI fabricated at the Oak Ridge Center for Nanophase Material Science (CNMS) using magnesium-doped thin-film lithium niobate on silicon oxide on silicon. This MMI can function as a compact, broadband filter to suppress transmission of selected frequencies. We demonstrate that this 1x1 MMI transmits 1550 nm light while successfully blocking 775 nm. The 775 nm transmission through a waveguide and the 1x1 MMI is 12-15 dB lower than through straight waveguides without the device. To demonstrate broadband applicability, tests were performed with a Continuously Tunable Laser (CTL), which showed that results were similar within 30 nm ranges centered around 775 nm and 1550 nm respectively. We present simulations of the electric field, as well as fabrication and measurement results.

Topical Area

Hard matter: quantum, electronic, semiconducting materials

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