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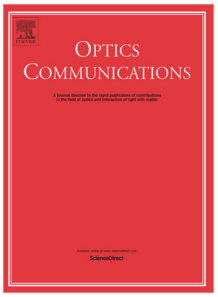

Liquid crystal cells with subwavelength metallic gratings for transmissive terahertz elements with electrical tunability

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Liquid crystal cells with subwavelength metallic gratings for transmissive terahertz elements with electrical tunability

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Abstract: We report the propagation properties of polarized terahertz (THz) waves in a liquid crystal (LC) cell with subwavelength metallic gratings to produce transmissive THz elements with electrical tunability. One-dimensional metallic gratings, which can be used both as transparent electrodes and linear polarizers in the THz regime, were fabricated on the quartz glass substrates of the LC cell. The substrates with and without the metallic grating showed almost identical transmission spectra for a linearly polarized THz wave whose electric field was parallel to the grating vector. We fabricated a 90°-twisted nematic LC cell using the two substrates with the metallic grating and examined its transmission spectra in the THz regime. During these measurements, we applied a voltage to the LC via the metallic gratings. We calculated in detail the transmission spectra and its voltage dependence based on the effective medium theory for subwavelength structures, the continuum theory of twisted nematic LCs, and the optical constants of the LC in the THz