345. Title:Broadband multi-layer terahertz metamaterials fabrication and characterization on flexible substrates
Authors:Han, N.R. (1); Chen, Z.C. (1); Lim, C.S. (2); Ng, B. (2); Hon, M.H. (1)
Source title:Optics Express
Abbreviated source title:Opt. Express
Volume:19
Issue:8
Issue date:April 11, 2011
Publication year:2011
Pages:6990-6998
Language:English
Document type:Journal article (JA)

Abstract:Microscopic split-ring-resonator (SRR) arrays are fabricated on 100 μm thick polyethylene naphthalate (PEN) films by femtosecond laser micro-lens array (MLA) lithography. The transmission properties of these metamaterials are characterized by THz Time Domain Spectroscopy (THz-TDS). Tunable resonance responses can be achieved by changing SRR structural design parameters. By stacking 2D PEN metamaterial films with different frequency responses together, a broadband THz filter with full width at half maximum (FWHM) of 0.38 THz is constructed. The bandwidth of the resonance response increases up to 4.2 times as compared to the bandwidths of single layer metamaterials. Numerical simulation reveals that SRR layers inside the multi-layer metamaterials are selectively excited towards specific frequencies within the broadband response. Meanwhile, more than one SRR layers respond to the chosen frequencies, resulting in the enhancement of the resonance properties. The multi-layer metamaterials provide a promising way to extend SRR based metamaterial operating region from narrowband to broadband with a tunable feature.