

Fabrication of 3D Photonic Structure with Block Copolymer Confinement Effects Operating in Visible wavelength

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Split ring resonators(SSR) have received many interests because they can realize negative permeability, which is necessary for realizing the negative refractive index. Until now, most of these structures were fabricated by top-down method, which have limits in large area fabrication and operation limits. Here, we propose new approaches to fabricate SSR structures over a large area (~cm²) exhibiting multiple electromagnetic responses in visible and near-infrared wavelengths. Confining polystyrene-block-poly (methyl methacrylate) copolymer (PS-b-PMMA) inside cylindrical pores of aluminum oxide (AAO) template followed by selective etching of PMMA, concentric PS rings structure are achieved. Final SSR structures are achieved with gold deposition on PS nanodomains. This concept of fabricating SSR structure with block copolymer self-assembly and incorporating plasmonic metals into one nanodomains could be applied to realize large-scale metamaterials working at visible and NIR wavelengths.