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**Thermally Tunable Metallodielectric Photonic Crystals from Self-assembly of Brush Block Copolymers and Gold Nanoparticles**[1]
DONGPO SONG, CHENG LI, NICHOLAS COLELLA, XUEMIN LU, JAMES WATKINS, University of Massachusetts Amherst — Photonic crystals (PCs) based on the self-assembly of block copolymers (BCPs) are under intense investigations, providing new opportunities for simple fabrication of flexible photonic devices or coatings in an inexpensive and scalable way. The precise control and selective incorporation of inorganic nanoparticles (NPs) into specific domains of the microphase separated BCPs can be used to tune the optical constant of the target domains and create hybrid materials with unique optical properties. In this work, we demonstrate a simple strategy for rapid fabrication of well-ordered metallodielectric 1-D PCs using PS-*b*-PEO brush BCPs as the templates and H-bonding as the driving force for selective incorporation of phenol-coated gold nanoparticles (NPs) into PEO domains. By varying gold NP loading or molecular weight of the brush BCP, periodic layered metallodielectric structures with the domain spacing controlled from 120 nm to 261 nm were readily created resulting in reflection of light widely tunable from the visible to near IR regions (458-1010 nm). The control over size as well as the distribution of the gold NPs in the well-ordered structure was realized through simple thermal treatment, showing significant effects on the optical properties.

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Dongpo Song
University of Massachusetts Amherst

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