Abstract Submitted
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Isotropic Structural Color of Nanostructured Metal Surfaces SYLVANUS Y. LEE, Dept of Mechanical Engineering, Boston University, CARLO FORESTIERE, ALYSSA J. PASQUALE, GARY F. WALSH, Dept of Electrical and Computer Engineering, Boston University, MARCO ROMAGNOLI, PhotonIC Corp., LUCA DAL NEGRO, Dept of Electrical and Computer Engineering, Boston University — Engineering angularly insensitive (i.e., isotropic) structural coloration in metals without employing extrinsic materials have been a challenge due to the strong absorption properties of metals in the visible range. In this study, by combining plasmonic resonances of metallic nanoparticles and incoherent light scattering from deterministic arrays with isotropic and diffuse Fourier space, we demonstrate isotropic structural coloration of metal films with spatial uniformity and angular insensitivity. Specifically, we explore the angular scattering properties of aperiodic gold nanoparticle arrays with Pinwheel geometry and their hyperuniform counterpart (Delaunay-triangulated Pinwheel centroid, DTPC). The structures are designed by electromagnetic simulations based on the Coupled Dipole Method in partnership with three dimensional Finite Difference Time Domain modeling of plasmonic resonant nanoparticles on gold films. The experimental characterization is performed by measuring the far-field scattering spectra of the proposed arrays using angle-resolved reflection spectroscopy under white light illumination. The measured radiation diagrams of the fabricated plasmonic arrays demonstrate controllable and isotropic coloration of gold films. The proposed approach can potentially advance plasmonic applications to display, tagging and colorimetric sensing technologies.

Sylvanus Y. Lee
Dept of Mechanical Engineering, Boston University

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