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Polarization-tuned dynamic color filters exploiting a dielectric-loaded one dimensional aluminum grating

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Nanostructured spectral filters enabling dynamic color tuning are regarded to be saliently attractive for implementing ultra-compact color displays, holographic imaging, information encoding, and anti-counterfeiting. Realization of polarization-induced dynamic color tuning via one dimensional periodic nanostructures remains as a challenge due to their inherently low transmission for transverse-electric polarization. We report on highly efficient dynamic subtractive color filters incorporating a dielectric-loaded one dimensional Aluminum grating, providing a continuum of customized color in accordance with the polarization of incident light. The dynamic spectral filtering in the visible regime is attributed to selective suppression in transmission spectra originating from plasmonic resonance for a metal-dielectric interface and guided-mode resonance for a metal-clad dielectric waveguide occurring at their characteristic wavelengths for transverse-magnetic and -electric polarizations, respectively. Taking into account that the transmitted color output is initially determined contingent upon periods of a metallic grating, we manufactured several devices with different periods so as to accomplish a broad palette of color with transmission beyond 80%, inclusive of cyan, magenta and yellow, by tailoring the polarization. Moreover, the proposed filters conspicuously feature a dual-mode operation of both transmissive and reflective configurations. Thanks to the functional material of Al, which is advantageous in terms of low cost, high durability, and mass producibility, the proposed device is predicted to offer strong potential for immediate commercial applications.

Biography

Vivek Raj Shrestha completed BE in Electronic and Communication Engineering from Nepal in 2010 and he has been pursuing his integrated masters and PhD program in Electronic engineering at Kwangwoon University, Seoul, Korea since 2011. He has worked on integrated optical devices and free space optical modules. His current research interests include the nano-structured devices, serving as the visible optical filters and their application to communication devices, sensors and display devices. He has published more than 12 papers in reputed journals including *Nanoletters, Scientific Reports,* and *Optics Express* etc.

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