Properties of photonic and plasmonic resonance devices
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Nanostructured dielectric and metallic thin films exhibit various novel optical effects elucidated in recent years by virtue of rapidly developing nanoscale fabrication and analysis technologies. Such effects are greatly expanding applications of periodic optical thin films to optical integrated circuits in photonic crystal platforms. Example device embodiments include narrow/broad band grating reflectors, all-dielectric bandpass filters, surface-enhanced Raman spectroscopy, compact plasmonic nonlinear optical templates, ultrahigh-Q optical resonators, and high throughput label-free biochemical sensors. Strong light confinement effect and associated resonance behavior are the main bases of these devices. In this paper, we present our recent progress on fundamental theory and experiment of subwavelength-periodic resonant thin films. We briefly review theory, design, fabrication, and optical measurement results on guided-mode resonance (GMR) bandpass filters and one-dimensional grating based omnidirectional light absorbers. These device classes potentially have broad application areas such as multiplexers/demultiplexers, display pixels, solar cells, stray-light rejection in telescopes and imaging devices, portable biochemical sensors and optical amplifiers. In addition, we discuss the essential physics of transmission resonances in metallic nanoslit arrays that have been the subject of longstanding debates. We theoretically show that surface-plasmonic Fano resonances at the entrance and exit interfaces cause interesting and perplexing modification effects on the nanocavity resonance properties. We also show that the attendant surface-plasmonic Fano resonance can generate ultrahigh-Q plasmonic nanocavity resonances which are important for strongly coupled cavity QED systems.

Biography
Jae Woong Yoon received his PhD in Physics from Hanyang University in Korea in 2006 and conducted Postdoctoral studies there until 2010. Since then he has been an Assistant Research Professor in the Department of Electrical Engineering at the University of Texas – Arlington. He has published more than 20 papers in reputed journals.

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