

Nanophotonics: dynamic isolators, absorption enhancement, and photonic band theory for meta-materials

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We review some of our recent efforts in aiming to use nanophotonic structures for novel device applications, and in seeking to advance the theory of optical meta-materials. Specifically, we show that a spatial-temporal refractive index modulation can be designed to achieve complete and linear optical isolation on-chip without the use of any magneto-optical effects. We will also discuss nanophotonic schemes that enhance light trapping in solar cells beyond the conventional Yablonovitch limit. Finally, we will seek to advance the theory of optical meta-materials, by formulating the band structure calculation of dispersive meta-material into a standard Hermitian eigenvalue problem. This formalism provides a global view of the system behavior over broad bandwidth, as well as insights into the origin of loss in meta-material systems.