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Light scattered by 'hedgehog' particles JOONG HWAN BAHNG, DOUGLAS MONTJOY, Univ of Michigan - Ann Arbor, WEI-SHUN CHANG, STEPHAN LINK, Rice University, NICHOLAS KOTOV, University of Michigan
— Sensitive to even a small perturbation in its construct, particles provide versatile and compact platforms with which to design electromagnetic responses. With great advances in the nanofabrication, diverse particle types exhibiting unique and useful scattered radiation patterns have been realized or theoretically predicted. In particular, particles exhibiting broadband scattering with flexibility to suppress backscattering and enhance forward scattering hold promises in a diverse array of photonics devices. Recently, we have reported the 'hedgehog' particles whose high aspect-ratio surface roughness elicits anomalous dispersion behavior that breaks the well-known "similarity rule". The 'hedgehog' particles represent a novel class of "rough" particles comprised of all dielectric components that lies within the Mie scattering regime due to wavelength comparable dimensions. In this research, in addition to deviation in the interaction potential as reported previously, we will show that high aspect ratio nano-topography also modifies electromagnetic responses from what is predicted by Mie theory for smooth dielectric particles. In detail, the high aspect-ratio interfacial nano-corrugation 1) educes broadband scattering at the visible spectrum, 2) suppresses resonant modes within the 'hedgehog' particles and 3) creates near-field profiles that elicits broadband suppression of backscattering and enhancement of forward scattering at visible spectral range and above.

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