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SHAPE OPTIMIZATION OF NANOPARTICLES FOR OPTICAL METAMATERIALS

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A composite comprised of small particles distributed in a host matrix (Figure 1) can be prescribed an effective electric permittivity ϵ_{eff} in the long wavelength limit. The effective permittivity is a function of the constituent material properties, volume fraction of the particles and also the shape of the particles (Figure 2). By optimizing the particle shape and tapping into the plasmonic resonance at the particle/matrix interface, we are able to design composites with near-zero permittivity and very low loss at optical frequencies.

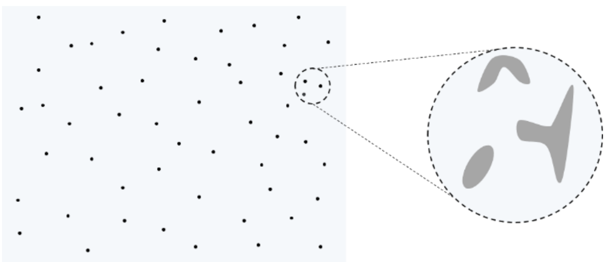

Figure 1: Composite comprised of particles embedded in host medium

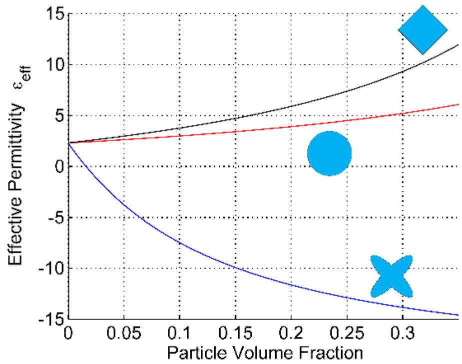

Figure 2: Effective permittivity as a function of particle volume fraction and particle shape

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