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Hollow Shells Of Dipoles: A Group Theoretical Approach[1]
CHRISTOPHER DEVULDER, SLAVA ROTKIN, Lehigh University — We investigate the plasmonic properties of hollow cylindrical lattices whose constituent elements are modeled as point dipoles. The symmetry of the lattice is described within the framework of group theory, which enables us to obtain the eigenmodes and eigenvalues of the entire polarization field by diagonalizing the dipole interaction part of the Hamiltonian. An incoming plane wave electric field that couples resonantly with the dipole lattice is expanded in terms of cylindrical harmonics, allowing us to precisely determine the contribution of various modes in its response function. The latter can then be obtained analytically for an arbitrary plane wave excitation. This work facilitates the study of cylindrical plasmonic shells with various geometry, as in the case of gold nanoparticles surrounding carbon nanotubes.

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