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Tailoring the plasmonic modes of metal nanoparticle arrays with lattice anisotropy KING CHUN LAI, SZE FUNG LEE, KIN WAH YU, The Chinese University of Hong Kong — We have studied the plasmonic band structure of three-dimensional lattices of nanoparticles under external electromagnetic waves. The long-range dipolar forces among polarized nanoparticles lead to the collective motion of the dipole moments to form plasmon. The resulting plasmonic dispersion thus depends on the polarizability of individual particle and the lattice structure of the whole system. We tailor sets of desirable plasmonic modes through varying the polarizability of nanoparticles or lattice anisotropy which can be tuned by incident GHz ultrasonic waves. Similar work of one-dimensional particle chain was contributed by Maier (2003), but we further extend the system into three-dimensional cases. In order to deal with the long-range interactions, we adopt the Ewald method to develop a viable means for calculating the plasmonic dispersion relation. Furthermore, we consider the formalism for diatomic basis of nanoshell. The plasmonic modes of each particle may couple and form hybridized plasmonic band attributed to level repulsion effect. This method provides a flexible way to manipulate plasmonic wave in a lattice by tuning the characteristic parameters of particle shape or lattice structure.

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