RADIATIVE PROPERTY OF PLASMONIC PARTICLE CLUSTER IN DIFFERENT ARRAY AND PAERTICLE CHAIN

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The radiative properties of dense plasmonic particle clusters are important in engineering applications (e.g. solar-to-thermal energy conversion [1]). The interference effect becomes more pronounced and complex as the volume fraction occupied by the particles increases. The geometric array and particle chain of the particle cluster is important factor for the radiative properties [2].

In this study, the radiative properties of dense plasmonic nanoparticle clusters in 3D assemblies with different array and particle chain were calculated using the finite element method (FEM). The number of particles n_p was 5. The particle diameter d_p was 30 nm. In practice, the particle cluster has a random array; however, a specific distance (cl = 3 nm) was considered. The refractive index of the background media was assumed to be n = 1.00 (air) to simplify the simulation. The number of minimum distance was assumed as particle chain n_c and n_c = 4, 5, 6 and 7 were considered. *y*, *z*, *x* polarized plane wave incident from *x*, *y*, *z* directions, respectively. Scaling factor was calculated against the radiative properties in independent scattering. Averaged calculated results were shown in Fig. 1.

About the scattering coefficient, the scaling factor increased with the increment of n_c because the interference effect increased. However, about the absorption coefficient, it is shown that .the scaling factor cannot be standardized by only n_c. It indicated that the effect of geometric array on the radiative property cannot be neglected.

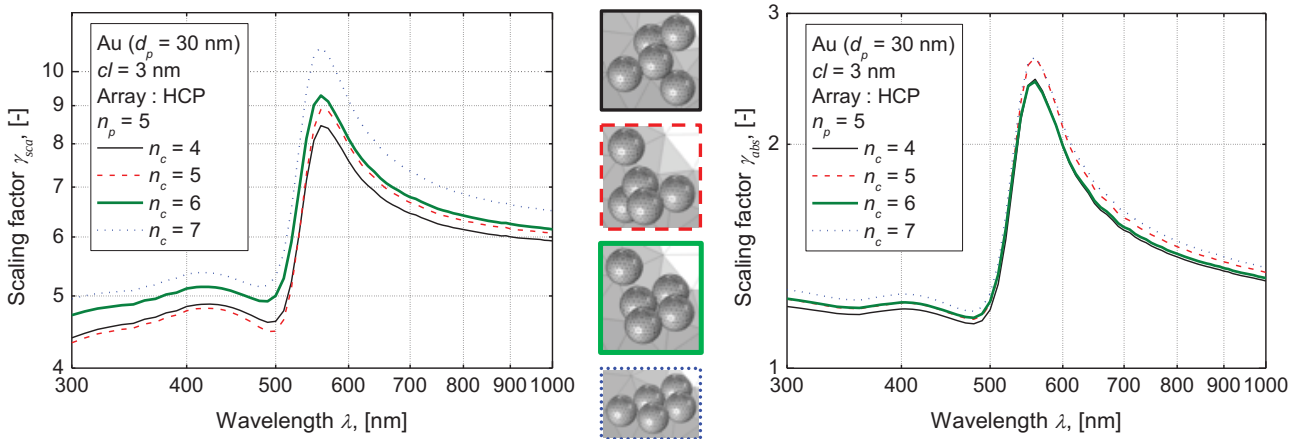

Fig. 1 Effect of particle chain number on scaling factor

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