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Radiation force of a Gaussian beam on a chiral plasmonic nanoparticle

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Using electromagnetic waves [1-7] to push an object has attracted considerable attention duo to its potential applications in optical capture, sorting various biological cells, etc. The plasmonic nanoparticle in this paper is composed of a chiral sphere and a thin metallic shell. A larger radiation force is exerted on the plasmonic nanoparticle than that of a pure chiral sphere. The influence of the chirality parameter of the core on the radiation force under the Gaussian beam incidence is numerically analyzed.

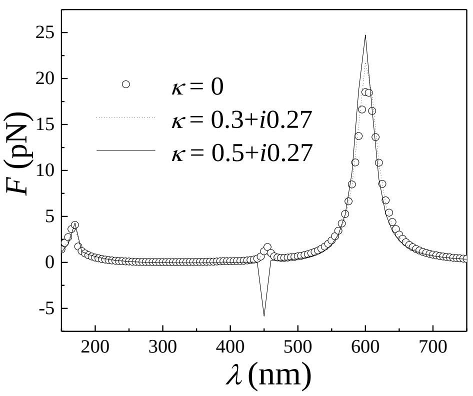

Fig 1. Radiating force on the coated sphere with distinct chirality parameters

Figure 1 shows the effect of the chirality parameter on the radiation force of a coated sphere. Medium parameters of the dielectric sphere with a radius of 35 nm are $\varepsilon=1.36^2\varepsilon_0$ and $\mu=\mu_0$. The power of the incident wave is P=0.1 W and beam waist radius is w_0=1.0 μm. The metallic shell is made of silver (Ag) and its thickness is 5 nm. The relative permittivity of silver can be seen in Ref. [8]. One can find two different plasmon resonance peaks of the pushing force upon the coated sphere around 165 nm and around 605 nm and an additional resonance peak around 450 nm in Fig 1. In addition, the direction of the radiating force reverses and the amplitude increases around 450 nm as the chiral parameter increases.

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