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ABSORPTION AND PLASMON RESONANCE OF BI-METALLIC CORE-SHELL NANOPARTICLES ON A DIELECTRIC SUBSTRATE

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ABSTRACT. Numerical investigation of absorption efficiency profiles and localized surface plasmon resonance (LSPR) wavelengths are performed for metallic core-shell nanoparticles (NPs) placed over a BK7 glass substrate. Gold (Au) and silver (Ag) metallic components are used in two different core-shell structures. This numerical study is performed with vectorized version of the discrete dipole approximation with surface interactions (DDA-SI-v). Absorption enhancement and the hybrid modes of plasmon resonances of the core-shell structures are compared by using a metric that defines a size configuration. It is observed that small volume fraction of the core sizes results in shell domination over the plasmon response. Moreover, an additional study is conducted to discern the sensitivity of the refractive index of nanoparticles in different surrounding environments. With a selected core-shell size configuration of Ag-Au pairs, a significant absorption enhancement with a redshift of LSPR wavelength is observed for both Ag core-Au shell and Au core-Ag shell NPs. These findings show the possible targeted uses of metallic core-shell nanoparticles in local heating, bio-sensing, and material detection applications.