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Engineered Biodecorated Nanoparticles

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Abstract

Plasmonic noble metal nanoparticles demonstrate unique sizedependent optical and photothermal properties due to the collective oscillation of free electrons in their conduction bands. The intensity of absorption and scattering of noble metal nanoparticles is significantly higher than most absorbing and scattering organic molecular dyes, which makes them excellent candidates as contrast agents in imaging. Electron-phonon and phonon-phonon interactions in gold nanoparticles results in the generation of heat following exposure to Near Infrared (NIR) light. Cylindrical gold nanorods also demonstrate a tunable photothermal response to NIR light as a function of nanoparticle aspect ratio. Quantum dots display unique optical properties, including sharp and symmetrical emission spectra, high quantum yields, broad absorption spectra, good chemical and photostability, and tunable size-dependent emission wavelengths. They have been evaluated extensively for use as optical imaging probes both in vitro and in vivo. Magnetic nanoparticles are widely studied and applied in various fields of biology and medicine such as magnetic targeting, magnetic resonance imaging, diagnostics, immunoassays, gene cloning, and cell separation and purification. The polymeric nanoparticles are reported to act as delivery vehicles for imaging contrast agents and therapeutics. Dendrimers and other hyper-branched organic polymers and liposomes have also been extensively evaluated for their potential in imaging and drug delivery applicatons. The hybrid nanomaterials, namely silica-based nanomaterials and nanoscale metal–organic frameworks, that have been recently explored are used for imaging and therapeutic applications.

Keywords: Dendrimers, Magnetic and Hybrid Nanoparticles, Noble Metal, Quantom Dots