Effect of Nanoparticle Morphologies on Signal Strength in Photoacoustic Sensing

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Abstract

Photoacoustic sensing has the potential to probe to greater depths in tissues compared to optical microscopy. The use of plasmonic nanoparticles can further enhance the photoacoustic signal and the resonances of metallic nanoparticles, e.g. gold, can be aligned with commonly used visible and near-IR laser wavelengths. In addition, surface functionalised nanoparticles can be used to target specific biomolecules. In this work, we report the synthesis of spherical gold nanoparticles with a plasmonic extinction peak at 532 nm and two sizes of star shaped gold nanoparticles with extinction peaks at 532 nm and 600 nm. The nanoparticles were incorporated into tissue phantoms and the relative performance of the generation of photoacoustic signals from these different nanoparticle morphologies was investigated. At an excitation laser wavelength of 532 nm, we found that the spherical gold nanoparticles generated the greatest photoacoustic response.

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