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Plasmonic behaviour of phenylenediamine functionalised silver nanoparticles

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Abstract

The surface functionalisation of AgNPs has demonstrated improved capability for various applications by modifying their surface chemical conditions. In this study, AgNPs functionalised with *p*-phenylenediamine (PPD) ligand were prepared, and the plasmonic effects of the nanocomposites were then investigated. The synthesis and functionalisation of Ag nanocomposites were achieved through chemical modification reaction of naphthalene group through hydrothermal synthesis. The influence of the chemical modification reaction on the plasmonic behaviour and size variation were obtained via optical measurement techniques such as UV–visible spectroscopy (UV–Vis) for absorbance characteristic, photoluminescence for emission response and micro-Raman spectroscopy (MRS) for SERS study on the presence of regions containing AgNPs and PPD ligand. It was observed that the one-step process of deprotonation of the amino group on the aromatic rings gives the re-arrangement of the electron cloud towards the π-conjugated system. High-resolution transmission electron microscope (TEM) analysis showed the formation of the nanocomposites and the AgNPs (for ~4 and ~5 nm of diameter sizes) are well-dispersed over the PPD matrix. The nanocomposites are assembled into higher dimensional structures through coordination with functional PPD ligand and also increasing the PPD amount led to the increase in the surface area of the nanoparticles.