Composition controlled synthesis of gold and silver nanoparticles and their sequential surface modification with enzymes: Imparting new properties

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Abstract: Development of metal nanoparticles for biological and industrial usages necessitate a profound understanding of nano-bio interface. Interaction of metal nanoparticle’s with biological systems and industrial products critically depends on their physicochemical properties. Therefore, the vital surface properties and composition of metal based nanoparticles have to be carefully designed for specific applications (1-4). In current research, we have formulated gold, silver and their bimetallic gold-silver nanoparticles with different ratios using ‘quercetin’, and further modified nanoparticle’s surfaces with enzymes (Figure 1). The key reasons why we have used quercetin are (a) quercetin has reducing groups that can reduce metal ions into their atoms; (b) their bio-importance; and (c) structured shell of quercetin bound to the surface of nanoparticles helps in anchoring these nanoparticles with other biomolecules such as enzymes. Moreover, employing quercetin as reducing agent for nanoparticles synthesis is a major step towards eco-friendly assembly of bimetallic nanoparticles of different compositions in single step. All the nanoparticles fabricated during this study have been characterized by UV-VIS spectrometry, Fourier transform infrared spectroscopy (FTIR), dynamic light scattering (DLS), transmission electron microscopy (TEM) and Zeta potential analyzer for their size, composition, surface chemistry and surface charge. Currently, we are estimating various biological and industrial usages of these functional nanoparticles such as free radical scavenging capacity (RSC), antimicrobial potential, in-vitro peroxidase enzyme-like behavior, organic dye degradation and industrial production.
**Figure 1:** Schematic representation of quercetin mediated synthesis of gold (Au), silver (Ag) and gold-silver (AuAg) bimetallic nanoparticles with composition control and their surface modification with enzyme moieties.

**References**