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Development of fluorescent gold nanoclusters for selective detection of ions and small molecules in aqueous medium



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Gold nanoparticles (Au NPs) and gold nanoclusters (Au NCs) having characteristic plasmonic or highly photoluminescence features have become one of the most important types of nanomaterials that have been extensively investigated in many fields. The sub-nanometer sized Au NCs show unique physical and chemical properties such as, well-defined molecular structure, discrete electronic transitions and characteristic size-tunable photoluminescence. Most of the protein-stabilized Au NCs exhibit intense red photoluminescence ($\lambda_{\text{emission}} \sim 650 \text{ nm}$) which originates from the icosahedron gold core and partially independent from the applied protein. In this work presented here, we highlighted the biocompatible fabrications of Au NPs and Au NCs using proteins (bovine serum albumin (BSA); lysozyme (LYZ), gamma-globulin (γ G), nucleotide (adenosine monophosphate (AMP) and amino acids (histidine (His); tryptophan (Trp), cysteine (Cys), which result in different nanostructures having tunable blue, green, yellow and orange emissions. The main goal of this work was to investigate the spontaneous interactions of AuCl_4^- and the studied biomolecules as well to optimize the gold/ligand ratios and pH on the formation of gold constructs. Based on the experimental results, we provided important information on the gold intermediates and the formation mechanisms of the plasmonic or fluorescent nano-objects. Moreover, the fluorescent Au NCs were used for selective detection of different transition metal ions (e.g. Fe^{3+}), anions and small molecules in aqueous solutions.

Biography

Edit Csapó is a Senior Research Fellow at MTA-SZTE Biomimetic Research Group, Department of Medical Chemistry, University of Szeged, Hungary, and an Assistant Professor at the Department of Physical Chemistry and Materials Science, University of Szeged, Hungary. She received her PhD degree in Chemistry at University of Debrecen, in 2010. Currently, her research interests focus on the preparation and characterization of noble metal-based nanohybrid systems, protein-polymer, biocompatible surfactant-based drug-containing nanocomposites and surface plasmon resonance investigations. She has published nearly 40 papers in reputed journals (more than 105 impact factors and sum of times cited 400).

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