Sibakoti, T. R., Stinger, C. R., Adhihetty, P. K., Zamborini, F. P., & Nantz, M. H. (2019). Tunable Aminooxy-Functionalized Monolayer-Protected Gold Clusters for Nonpolar and Aqueous Oximation Reactions. *Particle & Particle Systems Characterization*, *36*(7), 1900093. https://doi.org/10.1002/ppsc.201900093

Definitions

- **Aminooxy Group**: A chemical group (–ONH2) that reacts with carbonyl compounds like aldehydes and ketones.
- **Oximation Reaction**: A chemical reaction where aminooxy groups react with carbonyl compounds to form stable compounds.
- **Monolayer-Protected Clusters (MPCs)**: Gold nanoparticles covered with a single layer of organic molecules.
- **Ligand**: A molecule that binds to another (usually larger) molecule.

Key Findings

- Researchers developed a new type of ligand that can be added to gold nanoparticles, allowing them to react with various carbonyl compounds.
- These modified nanoparticles can work in both non-polar and aqueous (water-based) environments.
- The new method enhances the versatility and stability of the nanoparticles, making them useful for future applications in sensing and catalysis.

Introduction

The study explores the use of a new aminooxy-functionalized ligand to enhance the chemical reactivity of gold nanoparticles. This work aims to improve the nanoparticles' ability to react with carbonyl compounds, which are important in various chemical and biological processes.

Main Content

Background

Gold nanoparticles are widely used in scientific research due to their unique properties. By attaching different molecules, known as ligands, to their surface, scientists can control their reactivity and stability. Aminooxy groups are particularly useful because they selectively react with carbonyl compounds, forming stable products.

Methods

- **Synthesis of Ligands**: Researchers synthesized a new aminooxy thiol ligand through a series of chemical reactions.
- **Functionalization of Gold Clusters**: The new ligand was attached to gold nanoparticles using a ligand exchange process, creating mixed monolayer-protected clusters (MMPCs).
- **Oximation Reactions**: The modified nanoparticles were tested for their ability to react with various aldehydes and ketones in both non-polar and aqueous environments.

Results

- The new ligand was successfully attached to the gold nanoparticles, resulting in stable and soluble clusters.
- The nanoparticles reacted efficiently with a variety of aldehydes and ketones, forming stable oxime ether adducts.
- The modified nanoparticles demonstrated the ability to work in different environments, including water, which is crucial for many biological applications.

Conclusion

The study presents a new method for functionalizing gold nanoparticles with aminooxy groups, significantly enhancing their reactivity with carbonyl compounds. This development opens up new possibilities for using these nanoparticles in sensing, catalysis, and other applications. The ability to operate in both non-polar and aqueous environments makes these nanoparticles versatile and useful for a wide range of scientific research areas.

Word Count: 378