Noble metal nanoclusters surface-modified with amino acid derivatives

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Nowadays, various noble metal nanostructures are the focus of numerous research projects. Thanks to their unique optical and structural properties, they can be used in wide range of application, including electronics, (bio)catalysis, (bio)sensorics and biomedical science.

Our research group has been investigating the synthesis of noble metal nanoparticles and nanoclusters for 12 years. One of the main directions is the production of gold and silver-containing nanoclusters stabilized and surface-modified with small molecules, as well as the characterization of their structure and the exploration of their sensor applications. We have previously proven the applicability of various amino acids, such as phenylalanine [1] and tyrosine [2] , for the formation of blue-emitting nanoclusters. As a continuation of this research, we set out to investigate modified versions of the amino acids that had proven successful, with the aim of determining whether it is possible to tune or alter the structural and optical properties of the resulting clusters. The modification involved the incorporation of an electron-rich hydroxamic acid group with chelating properties in the case of the aforementioned phenylalanine and tyrosine ligands.

In my work, I investigated whether stable gold and silver nanoclusters with good optical properties can be prepared using hydroxamic acid derivatives of the amino acids tyrosine and phenylalanine. I primarily determined the experimental conditions governing the formation of the products, such as the ratio of the metal ion and the stabilizing ligand used, and the metal concentration, but I also examined the effects of temperature, pH, and reaction time. After the products were prepared, I also developed a protocol for their purification.

We determined the detection limit and, through temperature-dependent fluorescence quenching experiments, also determined the thermodynamic parameters of the quenching.

Keywords:

nanoclusters, hydroxamic acid, fluorescence quenching, noble metal

References:

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