Hydrothermal synthesis of water-soluble luminescent gold nanoclusters

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Luminescent gold nanoclusters (GNCs) are nanostructures consisting of about 100 gold atoms. They have attracted considerable attention due to their optical properties. These include discrete electronic states, size-dependent bright luminescence, photostability, large Stokes shifts, and a large variety of surface modificators. The most popular modifying compounds are different proteins and glutathione. They allow obtaining structures with the necessary properties and functional groups. GNCs are ideal luminescent labels for biological and chemical approaches, thanks to attractive features such as ultra-small size, good biocompatibility, and excellent photostability.

However, researchers have difficulties in synthesizing high luminescent GNCs with a minimum number of stages, high productivity, and economic efficiency. In this work, we provide a one-step hydrothermal approach for the green synthesis of bright luminescence GNCs. We varied synthetic time and temperature for the controllable obtainment of luminescent GNCs. To achieve this, an alkaline water solution of chloroauric acid and bovine serum albumin was heated in an autoclave at 60 – 160ºC for 1-3 hours. The increase in the synthetic temperature leads to obtaining the brown-crimson color of the solution. The obtained GNCs had a broad absorption band of 200-500 nm and bright luminescence at 660 nm. The obtained GNCs can be applied as analytical labels.