

## Synthesis, characterization, and dynamic of formation of gold nanorods face to different amounts of surfactant

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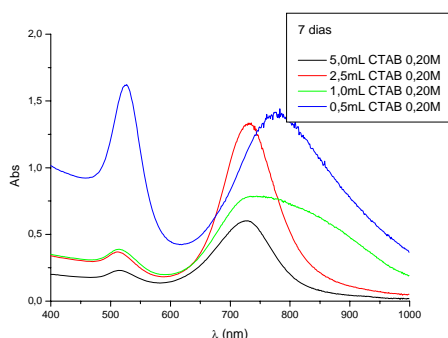
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**Abstract** – Gold nanorods have been prepared from tetrachloroauric acid ( $\text{HAuCl}_4$ ) via seed mediated method in water, using cetyltrimethylammonium bromide (CTAB) as template agent. The selectivity for formation of gold nanorods was evaluated in relation to the concentration of CTAB in the reaction medium. Transmission electron microscopy (TEM), and Uv-vis spectroscopy (UV-vis) were employed to characterize the particles obtained.

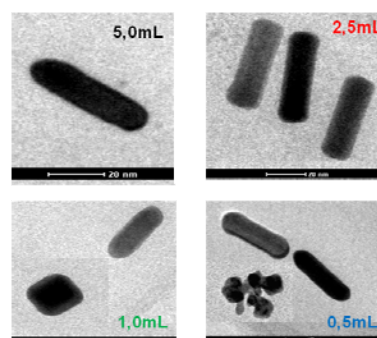
Colloidal gold nanoparticles have received special attention in recent years both due to their unusual properties, and promising applications in optical devices, biomedicine and catalysis [1]. Nanoparticles, possess size and shape dependent properties, differing markedly from their bulk behavior [2,3].

Common methods for size and shape control employ capping agents, such as surfactants, polymers, etc. to manage the growth in the nanometer regime. However, the procedures for shape-controlled preparation of monodispersed nanoparticles are limited. Occasionally capping agents allow shapes other than spheres [3]. The mechanism of such shape control is a result of specific interaction of the capping agents with different growing faces of the particles [4].

Our group has prepared gold nanorods based on a seed-mediated method, using water as dispersant agent [5]. Gold nanorods have been prepared from  $\text{HAuCl}_4$  as gold source, using CTAB as guide growing agent. We have evaluated the concentration of CTAB during the growing process of the gold nanorods. The formation processes of the nanoparticles were followed by UV-vis and TEM. Figure 1 show the UV-vis spectra of the aqueous colloidal gold nanorods solutions prepared with different amounts of CTAB. All spectra are consistent of colloids containing gold nanorods, since two absorption bands are observed, related to the two possible surface plasmon resonance. Nevertheless, it is possible to verify that the spectrum of the colloid prepared with 2.5 mL of CTAB 0.20 M presents a comparative well defined shape. This can be an indication of low dispersion of size and shape of the particles present in the colloid. This is confirmed by TEM images (see Figure 2). It is important to note that, independently of the amount of CTAB presented in the medium, the length:width aspect ratio of the nanorods formed was almost same, i.e.  $3.2 (45 \pm 6 \text{ nm length and } 14 \pm 5 \text{ nm width})$ . However, the selectivity on gold nanorods was different. Low amounts of CTAB lead to the formation of spherical particles; high amounts conduct to a high time consuming formation of the desired particles.



**Figure 1:** UV-vis spectra of the colloids, employing different concentrations of CTAB.



**Figure 2:** TEM images of the gold nanorods prepared, employing different concentrations of CTAB.

## References

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