Seedless Synthesis of Gold Nanorods: Some Features and Benefits

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Gold nanorods (GNRs) are of considerable interest for solving of various nanoplasmonics' problems [1]. This is due to the possibility of fine tuning of GNRs longitudinal plasmonic band in the near IR region by varying their aspect ratio. Conventional approach to the GNRs creation implies the preliminary synthesis of Au seed nanoparticles and their subsequent growth in "soft templates" – cetyltrimethylammonium bromide (CTAB) micelles [2]. Its main drawback is high sensitivity to the quality of the reagents (especially CTAB) [3]. Moreover, the GNRs yield crucially depends on medium pH, temporal stability of seeds and other experimental conditions.

Recently a significant interest is caused by the alternative route – so-called seedless synthesis. In this case, the seed nanoparticles are generated directly in the reaction mixture [4].

The goal of this study is careful examination of the peculiarities of GNRs seedless synthesis in CTAB micelles using the hydroquinone as reductant.

The influence all of the reactants on the yield and plasmonic properties of GNRs is analyzed.

A nonmonotonic dependence of position of GNRs longitudinal plasmonic band on hydroquinone concentration is revealed. The hydroquinone impact on the structure of micellar template is discussed.

The possibility of fine tuning of GNRs longitudinal plasmonic band by temperature variations is demonstrated for the first time. The preliminary data on evolution of plasmonic characteristics of GNRs during their growth are obtained.

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References

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