

Synthesis of dodecanethiolate protected gold nanoparticles

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-assume to use 100 mg of $\text{HAuCl}_4 \cdot 3\text{H}_2\text{O}$ -

To a vigorously stirred solution of 0.5 g of tetraoctylammonium bromide (2.5 equiv) in 27 mL of toluene was added 0.1 g of $\text{HAuCl}_4 \cdot 3\text{H}_2\text{O}$ (1 equiv) in 8 mL of deionized water. The yellow $\text{HAuCl}_4 \cdot \text{H}_2\text{O}$ aqueous solution quickly clears and the toluene phase becomes orange-brown

The organic phase is then isolated, the desired amount of dodecanethiol is added, and the resulting solution is stirred at room temperature for at least 10 minutes.

Dodecanethiol: 1 equiv. 2 equiv. 3 equiv.

The solution temperature is adjusted to 0°C by using a melting ice bath, the reaction solution is then vigorously stirred and NaBH_4 (0.125 g, 10 equiv) in 8 mL of deionized water is added over a fixed period of time.

Time: 1 minute (for 1 equiv. dodecanethiol); 10 seconds (for 2 and 3 equiv. dodecanethiol).

The now very dark organic phase is kept under stirring at the reduction temperature for 30 minutes and at room temperature for at least another 3 hours. The organic phase is collected, and the solvent removed on a rotary evaporator (this step should not exceed 50°C to prevent partial product decomposition). The black product is suspended in 30 mL of ethanol, briefly sonicated to ensure complete dissolution of byproducts, collected on a glass filtration frit, and washed with at least 80 mL of ethanol and 150 mL of acetone and dried in air.