*2-phase synthesis of gold nanoparticles*

Gold(III) chloride trihydrate, is a common precursor in the synthesis of gold nanoparticles. In this synthesis, a chemical reduction of gold(III) to gold (0) will take place using the organic cationic surfactant Benzyldimethyltetraammonium chloride[[1]](#footnote-1), and reducing agent sodium borohydride. The synthesis is carried out as a bi-phasic reaction in toluene and water. The reproducibility of the synthesis will be tested, and following a post-synthesis work-up, solid gold nanoparticles will be obtained.

Materials (wear gloves and operate in the fume hood!)

1. HAuCl43H2O (30 mL, 0.3 mmol, hygroscopic)
2. Alkyldimethylbenzylammonium Chloride, powder (1.474 g, 4 mmol)
3. Sodium borohydride (0.38 g, 10 mmol)
4. Deionized water (MilliQ, 25 mL)
5. Toluene (80 mL)

Procedure

To a 250 mL RBF equipped with condenser, add 30 mL of the HAuCl43H2O solution. Heat gently under reflux for approx. 5 minutes. To the 30 mL solution, add Bz (1.474 g, 4 mmol) dissolved in 80 mL Toluene. Allow mixture to stir with heat for approx. 15 minutes. When the mixture appears even, add sodium borohydride (0.38 g, 10 mmol) dissolved in 25 mL of deionized water, drop-wise over a period of 10 minutes. Immediate coloration will be observed. Let the final mixture stir with heat under reflux for an hour to ensure gold is completely reduced.

Post-Synthesis

The synthesis should yield two distinct layers; the top (organic) appearing dark pink/purple, while the bottom (aqueous), clear. Separate the two layers and save both phases. The top layer (organic) is immediately evaporated, then dried to obtain solid gold nanoparticles.

Clean up, label, and store your samples following synthesis!

Cheers!

A final note: If you see a way to make this synthesis better, speak up. This is a novel synthesis, and as such is not patented/published/perfect.

See you in the lab!

1. Other names: Alkyldimethylbenzylammonium Chloride, Bz [↑](#footnote-ref-1)