SUPPORTING INFORMATION

A Novel Approach to Fingerprint Visualization on Paper by Nanotechnology: Reversing the Appearance by Tailoring the Gold Nanoparticles' Capping Ligands

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General information:

All reagents were purchased from Acros and Aldrich and used as received. Reversed osmosis and deionized (RO/DI) water was used both for the preparation of AuNPs and the development of latent fingermarks.

Synthesis of AuNPs stabilized by ligands 2-11 (except 5): AuNPs were prepared according to previously reported procedure.[1] Briefly, the following aqueous solutions were prepared: $HAuCl_4.3H_2O$ (8 mM), ligand (95 mM) and NaOH (300 mM). Appropriate amounts of the previous solutions were mixed to obtain a final solution containing $HAuCl_4$ (3 mM) , NaOH (38 mM) and ligand (12 mM) in a mixture of H_2O:MeOH (47:53 % v/v). The mixture was allowed to equilibrate for 1 hr, aqueous solution of $NaBH_4$ 150 mM (1.28 mL, 10 mM) was added dropwise. The solution was agitated by Vortex for 5min, then on an orbital shaker for 5 hours. The product was precipitated with 10% (v:v) NaCl (2.5 M) in methanol at -18 ^{0}C for 12-16 hours. The precipitate was centrifuged, resuspended in 70% MeOH/H_2O centrifuged again, dried overnight at room temperature, and resuspended in water (10 mL).

AuNPs stabilized by **6** and **7** were also synthesized under identical conditions except that NaOH was not added. The reason is that these thiols are readily soluble in water under neutral conditions.

AuNPs stabilized by ligands 5 and 12 were prepared according to a literature procedure.[2] Briefly, a solution of tetraoctylammonium bromide (0.6 mmol) in toluene (40 mL) was added to an aqueous solution of $HAuCl_4.3H_2O$ (0.3 mmol, 20 mL). A solution of **5** (or **12**) in toluene (10 mL , 0.3 mmol) was then gradually added

to the resulting, vigorously stirred mixture, followed by dropwise addition of a freshly prepared aqueous solution of $NaBH_4$ (3 mmol, 10 mL). After the mixture was stirred for 1 h, the organic phase was separated and washed with distilled water. The solvent was then completely evaporated in a rotary evaporator and dried in vacuum for 1 day. The black solid thus obtained was heat-treated at 155 ^{0}C for 30 min. The heat-treated product was dissolved in 30 mL THF.

TEM (transmission electron microscopy) analysis (Fig. 1) was used to confirm the formation of the AuNPs and determine their sizes and morphology. The average particle size of AuNPs stabilized by ligands 3 and 9 were in the range of 1-3 nm in diameter.

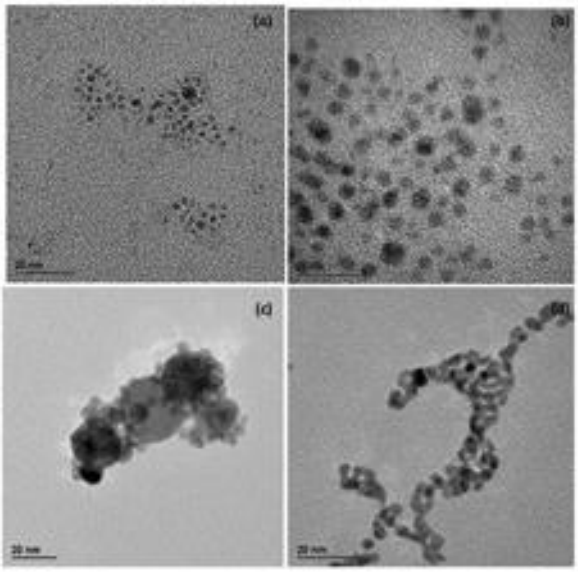

Fig. 1: TEM pictures of AuNPs protected by ligands 9 (a) and (b), and 4 (c) and 3 (d).

References

[1] P. D. Jadzinsky, G. Calero, C. J. Ackerson, D. A. Bushnell and R. D. Kornberg, Science, 2007, 318, 430.

[2] P. E. Laibinis and G.M. Whitesides, J. Am. Chem. Soc., 1992, 114, 1990.