**Electronic Supplementary Information** (**ESI**)

**Siloxane Bridge Linked Gold Nanoparticle-Liquid Crystalline Nanocomposite**

Olusegun Amos1,2\*; Georg H. Mehl1

1Chemistry Department, University of Hull, Hull HU6 7RX, United Kingdom.

2Department of Industrial Chemistry, Federal University, Lokoja, P.M.B 1154, Lokoja, Nigeria.

Email: Olusegunamos@yahoo.com; olusegun.amos@fulokoja.edu.ng,

\* Corresponding author

1. **Synthesis of AuNPMUD** [1-2]



Figure 1: Schematic synthesis of AuNPMUD

The method used for the synthesis of AuNPMUD is a modified method used for the synthesis of AuNPs.

To a solution of HAuCl4.3H2O (0.2065 g in 0.5 ml H2O) was added 11-Mercapto-1-Undecanol (0.03 g, 0.1 mmol) in THF (5 ml) and sonicated for 5 min. NaBH4 (0.086 g in 0.6 ml H2O) was added while sonication continued for 10 min. The black mixture was precipitated in ethanol (50 ml) and centrifuged (5000 rpm, 5 min) to have a black residue which was re-dispersed in ethanol. Centrifugation process was repeated three times to ensure complete removal of the excess and unreacted 11-Mercapto-1-Undecanol.



**(a)**



**(b)**

Figure 2: 1H NMR of (a) Free 11-mercapto-1-undecanol (b) AuNPMUD.

Compound **1** was synthesised as described in the literature [3].

1. **Synthesis of mesogen 2** [4, 5]



Compound **1** (0.33 g, 0.5 mmol) was dissolved in dry toluene (10 ml) and triethoxysilane (0.43 ml, 2.5 mmol) added under argon atmosphere and stirred for 30 min followed by the addition of 1,1,3,3-tetramethydidloxane Pt-complex (Karstedt’s catalyst, 0.1 M) in xylene (50 µl, 0.01 eq.). Stirring was continued for 18 h. The solvent and excess triethoxysilane was removed under vacuum to give a brown residue which was purified by PTLC using DCM as solvent to yield 0.26 g (63 %).

**1H NMR (400 MHz, CDCl3):** δ = 0.57 (t, 2 H, C*H2*Si), 0.82 (t, 6 H, C*H3*), 1.11 (m, 9 H, SiOCH2C*H3*), 1.12-1.14 (m, 26 H, CH2C*H2*), 1.49 (t, 4 H,CH2C*H2*), 1.78 (m, 6 H, OCH2C*H2*), 3.7 (q, 6 H, SiOC*H2*), 3.9 (t, 4 H, OC*H2*), 6.43 (d, 2 H, C*Harom*), 6.90 (d, 2 H, C*Harom*), 7.19 (d, 2 H, C*Harom*), 7.41 (d, 2 H, C*Harom*), 7.50 (d, 2 H, C*Harom*), 7.97 (d, 1 H, C*Harom*).

1. **Synthesis of nanocomposite 3** [4-5]



To AuNPMUD (45.7 mg) in ethanol (0.5 ml) was added solution of compound **2** (0.14 g, ~ 4 eq. w/w) in chloroform (2 ml) and 1M NaOH (40 µl). The mixture was stirred at room temperature for 12 h to ensure completeness of the reaction. Nanocomposite **3** was obtained by centrifuging the mixture (5000 rpm, 5 min), removing the supernatant, re-dissolving the residue in toluene and centrifuging. The process was repeated three times to ensure complete removal of free compound **2**. The nanocomposite **3** was dried in vacuo.



**(a)**



**(b)**

Figure 3: 1H NMR of (a) mesogen **2**; (b) nanocomposite **3**.

**References**

1. Raula, J.; Shan, J.; Nuopponen, M.; Niskanen, A.; Jiang, H.; Kauppinen, E. I.; Tenhu, H. *Langmuir*, 2003, 19, 3499-3504.
2. Di Pasqua, A. J.; Mishler II, R. E.; Ship, Y. L.; Dabrowiak, J. C.; Asefa,T. *Mat Letts*, 2009, 63, 1876–1879.
3. Zeng, B.; Liu, F.; Fowler, A. G.; Ungar, G.; Cseh, L.; Mehl, G. H.; Macdonald, J. E. Adv. Mater., 2009,**21**,1746-1750.
4. Umadevi, S.; Feng, X.; Hegmann, T. *Adv. Funct. Mater*., 2013, 23, 1393–1403.
5. Umadevi, S.; Feng, X.; Hegmann, T. *Ferroelectrics*, 2013, 431, 164–175.