# Supporting Information for:

# $AuCl_4^-$-Responsive Self-assembly of Ionic Liquid Block Copolymers for Composite Gold Nanoparticles and Polymeric Micelles with controlled morphologies

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## *S1 Materials*

Polyethylene glycol monomethyl ether ($CH_3O$-$PEG_{114}$-OH) (Mw=5000 and the polydispersity index PDI=1.05) was purchased from Fluka and used as received. 3-Bromo-1-propanol (95%), 1-Methylimidazole(98%), methacryloyl chloride(97%), triethylamine(99.5%), were purchased from Chemical reagent company of Shanghai, China. The used chain transfer agent, 2-cyanopropyl dithiobenzoate(CTA-1) and (4-cyanopentanoic acid)-4-dithiobenzoate (CTA-2), were prepared according to the literature procedure[1,2].

## *S2 Synthesis of ionic liquid monomer: 1-methyl 3-(2-methacryloyloxy propylimidazolium bromine).*

3-bromo-1-propanol (10g, 0.072 mol) and triethylamine(8.7 g, 0.086 mol) was firstly solved in 80mL dry THF and added into a three-neck 500 mL flask in an ice bath. Under nitrogen, a

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mixture of methacryloyl chloride( 7.8g, 0.086mol) and 80 mL THF was slowly added to the flask.

The reaction mixture was stirred at room temperature for 48 h and then filtered. The filtrate was washed with 300 mL DI water four times and dried with anhydrous magnesium sulfate. Finally, 3-bromopropyl methacrylate (70% yield) was obtained by removed organic solvent.

A typical quaternization reaction was used for preparation of ionic liquid monomer. Under the protection of nitrogen, the mixture of 3-bromopropyl methacrylate (4.4 g, 0.023 mol), 1-methylimidazole (2.2 g, 0.023 mol) and a small amount of hydroquinone (inhibitor) to a 50 mL flask. The mixture was stirred in an oil bath at 45 $^{o}$C for 72 h and yielded a yellow viscous liquid. The resulting MMPImB monomer was obtained by directly precipitated in 200 mL diethyl ether. $^{1}$HNMR(DMSO)，δ/ppm: 9.29(s, 1H), 7.75-7.84(d, 2H), 5.98(s, 1H), 5.88(s, 1H), 4.31(t, 2H), 4.12(t, 2H), 3.75(s, 3H), 2.19 (m, 2H), 1.85(s, 3H)

### *S3 Synthesis of PEG-CTA.*

$CH_3O$-$PEG_{114}$-OH (10.0 g) was dissolved in 150 mL of toluene and added in a three-necks round-bottom flask equipped with a magnetic stirring bar. After azeotropic distillation of 20 mL of toluene at reduced pressure to remove traces of water, 0.5650 g of CPAD and 0.0623 g of 4-dimethylaminopridine (DMAP) were added. When the solution was homogenized by stirring, 1.1598 g of 1, 3-dicyclohexylcarbodiimide (DCC) was added in portions. The reaction mixture was stirred at room temperature for 3 days. The precipitated urea was filtered. PEO-based macro-RAFT agent with pink color was obtained by precipitation of the filtrate into excess of diethyl ether three times, and then dried under vacuum at room temperature for 2 days.

## REFERENCES


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[2] S.H. Thang, Y.K. Chong, R.T.A. Mayadunne, G. Moad, E. Rizzardo. Tetrahedron Lett., 1999, **40**, 2435.