

Supporting Information

Induction Phenomenon and Catalytic Deactivation of Thiolate-stabilized Raspberry-like Polymer Composites Coated with Gold Nanoparticles

Maolin Li,^a Guofang Chen^{*a} and Shiper Bhuyain^a

^a *Chemistry Department, St John's University, Queens, New York, 11439, USA.*

** Corresponding Author*

** E-mail: gfchen08@yahoo.com; Fax: +1-718-990-1876; Tel: +1-718-990-8092*

1. Thermogravimetric analysis (TGA)

Figure S1 shows the TGA weight loss curves of PGMA, PGMA@PAH, and PGMA@PAH@AuNPs and alkythiolate stabilized sub-microspheres under air flow conditions; and the detailed thermal decomposition temperatures are shown in **Table S1**. Normally, the first weight-loss stage from room temperature to 100 °C is accredited to the evaporation of moisture in the samples. Under an air atmosphere, the TGA measurements were used to investigate the influence of the AuNPs on the thermal oxidative degradation of the PGMA matrix, and to determine the deposited amount of gold nanoparticles on polymer spheres. The PGMA shows the temperature at a 10% weight loss ($T_{-10\%}$) of 222.0 °C, while the PGMA@PAH and PGMA@PAH@AuNPs composites show higher $T_{-10\%}$ at 244.0 and 271.0 °C, respectively, while the alkythiolate stabilized composite particles displayed a temperature at a 10% weight loss near

280 °C, be it MPA or MHA stabilized composites or varied surface coverage of alkylthiolate. The increased thermal stability of the PGMA@PAH@AuNPs composites indicates the increased interaction between PGMA polymer chains after the modification of PAH and the enhancement of the interface bonding strength between the PGMA polymer surface chains and the AuNPs at around 200–300 °C. It also demonstrates that alkylthiolate ligands stabilizers can further improve thermal stability of the composite spheres.

As can be seen in **Table S1**, TGA analyses showed the residues of the PGMA, PGMA@PAH, PGMA@PAH@AuNPs at 695 °C were 0%, 0% and 18.9% respectively, which indicated the deposited AuNPs on the PGMA@PAH sub-microspheres was 18.9% since organic compounds are burned out and only AuNPs left at such a high temperature under air. The deposited amount of AuNPs for the alkylthiolate ligands-stabilized PGMA@PAH@AuNPs was also obtained by TGA analyses: 19.3% and 21.1% for long-chain MHA and short-chain MPA at the concentration of 0.02835 mM respectively. When the concentration of alkylthiolate ligand was increased to 0.1134 mM, the residues of alkylthiolate-stabilized polymer spheres were 18.7% and 18.8% for MHA and MPA ligands respectively at 695 °C under air. The obtained experimental results clearly demonstrate that the deposited amount of AuNPs on the polymer spheres is almost no change at the surface modification of alkylthiolate ligands under different chain lengths and different ligand surface coverages.

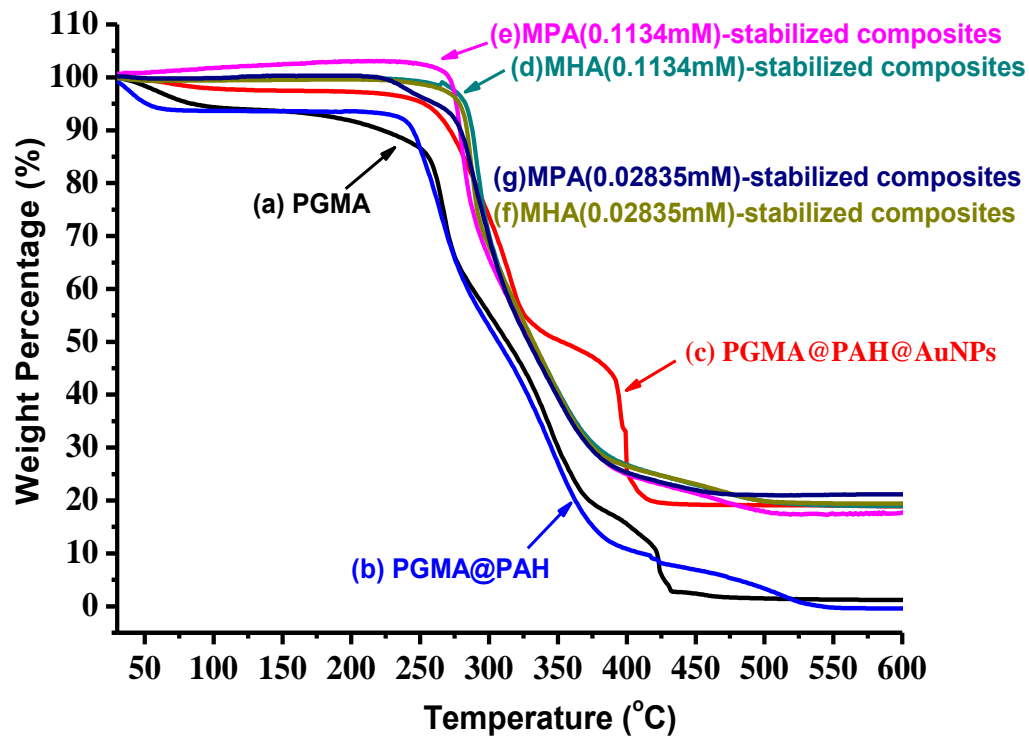


Figure S1 TGA weight loss curves of PGMA (curve a), PGMA@PAH (curve b), PGMA@PAH@AuNPs (curve c) composites, MHA(0.1134mM)-stabilized PGMA@PAH@AuNPs (curve d), MPA(0.01134mM)-stabilized PGMA@PAH@AuNPs (curve e), MHA(0.02835mM)-stabilized PGMA@PAH@AuNPs, and MPA(0.02835mM)-stabilized PGMA@PAH@AuNPs, under air flow conditions. PAH concentration = 0.75% (w/v), the ratio of PGMA@PAH to AuNPs = 1:50 (v/v)

Table S1. TGA characteristics of the measured samples under air

Samples	Alkylthiolate concentration (mM)	T_{.10%} (°C) ^[a]	T_{.50%} (°C) ^[b]	Residue at 695 °C (%)
PGMA	---	222	313	0
PGMA@PAH	---	244	306	0
PGMA@PAH@AuNPs	---	271	353	18.9
MHA-stabilized PGMA@PAH@AuNPs	0.1134	288	332	18.7
	0.02835	284	332	19.3
MPA-stabilized PGMA@PAH@AuNPs	0.1134	279	330	18.8
	0.02835	278	328	21.1
[a] is defined as the temperature at 10% weight loss of the tested specimen; and [b] is defined as the temperature at half weight loss of the tested specimen.				