

**Index of Supplementary Information of
“Colorimetric Assay of Homocysteine Using Gold Nanoparticles Conjugated with
Thermoresponsive Copolymer”**

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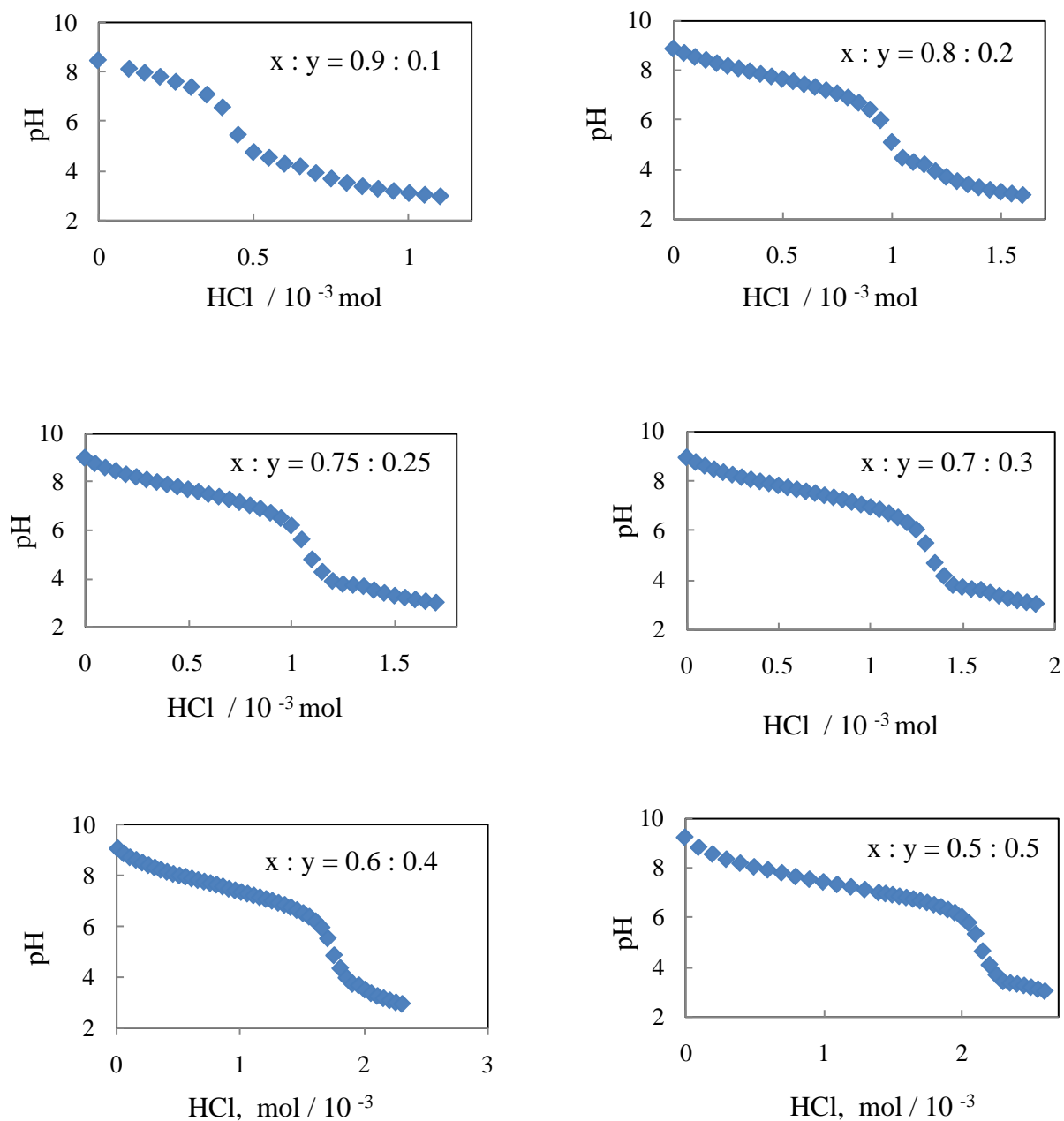
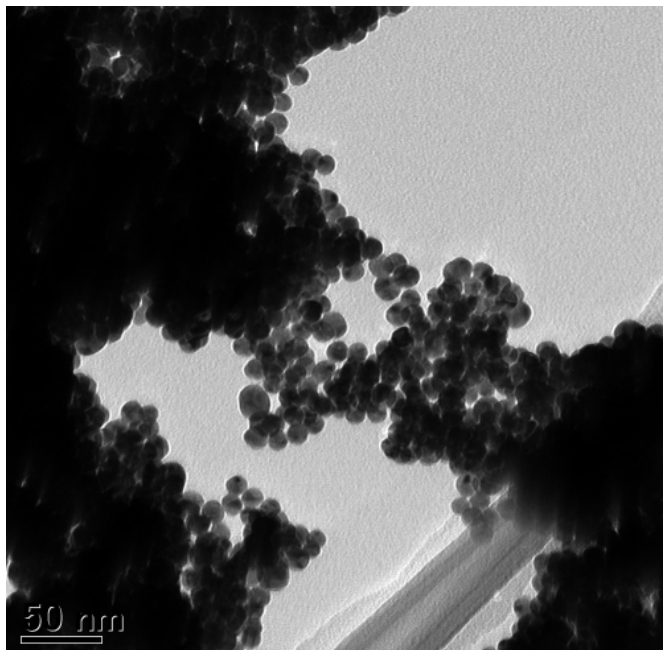


Fig. S1 pH Titration curves of 100 mL of 1 wt% poly (NIPAAm -co-DMAEMA) solutions

a) In the presence of homocysteine



a) In the absence of homocysteine

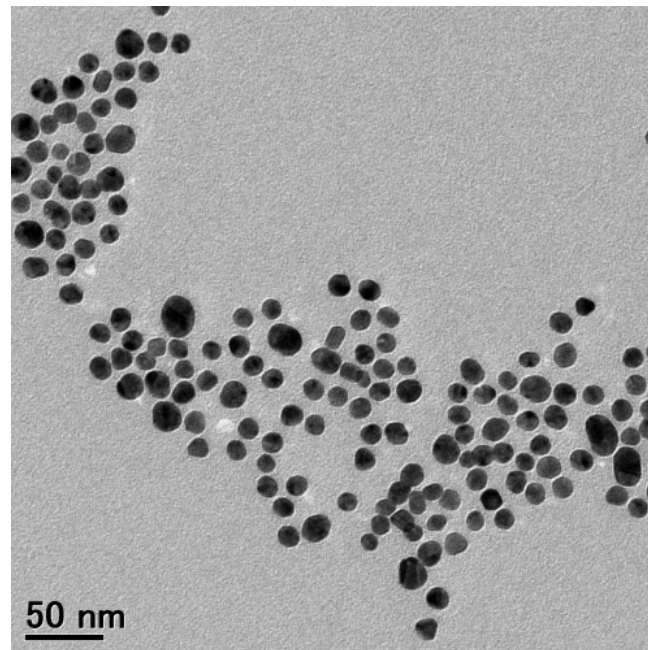


Fig. S2 TEM images of the gold nanoparticles conjugated with poly (NIPAAm-co-DMAEMA) a) in the presence and b) in the absence of homocysteine before and after heating and cooling.

The gold nanocomposite solution contains a) 1×10^{-4} mol/L homocysteine, b) no homocysteine, and 0.054 g/L gold nanoparticles conjugated with 0.05 wt % poly(*N*-isopropylacrylamide (90 mol %)-co-2-(dimethylamino)-ethyl methacrylate(10 mol %)) were used.

a) Before heating and cooling



3.1 4.0 5.1 6.1 7.1 8.1 9.0 10.1
pH

b) After heating and cooling



3.1 4.0 5.1 6.1 7.1 8.1 9.0 10.1
pH

Fig. S3 Photos of effect of solution pH on color of a gold nanocomposite solution a) before and b) after heating and cooling. The data correspond to Fig. 4 in the text.

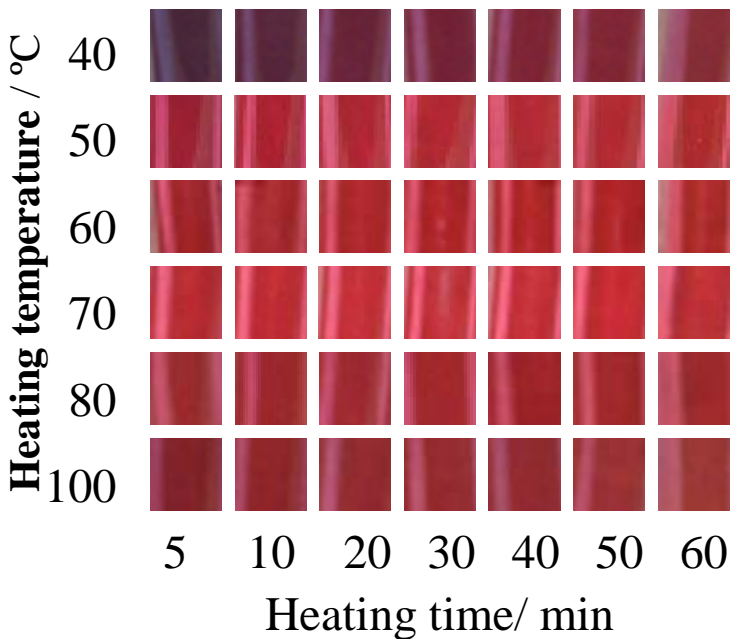


























Fig. S4 Photos of effect of heating temperature on color of a gold nanocomposite solution at various heating time.























The data correspond to Fig. 5 in the text.

Fig. S5-1 Effects of thiol compounds on the disassembly of the gold nanocomposites

Thiol compound	Without heating	With heating and cooling	Type of effects
Control			---
Thioglycolic acid			Facilitation
Ethylthioglycolate			Inhibition
3-Mercaptopropionic acid			Facilitation
Ethyl-3-mercaptopropionate			Inhibition
Butanethiol			No effect
Octanethiol			Inhibition
<i>n</i> -Dodecylmercaptane			Inhibition
1, 2-Etanedithiol			Inhibition
2-Mercaptoethanol			Inhibition
2,3-Dimercapto-1-propanol			Inhibition
3-Mercapto-1,2-propandiol			Inhibition

Continued to S5-2

Fig. S5-2 Effects of thiol compounds on the disassembly of the gold nanocomposites (continued)

Thiol compound	With heating	Without heating and cooling	Type of effects
2-Aminoethanethiol			Inhibition
4-Aminothiophenol			Inhibition
α -Toluenethiol			Inhibition
Reduced glutathione			Facilitation
Cysteinylglycine			Facilitation
Cysteine			No effect
Homocysteine			Inhibition
<i>N</i> -Acetylcysteine			No effect
Penicillamine			Inhibition
<i>N</i> -Acetylpenicillamine			Inhibition
Glutamylcysteine			No effect

The gold nanocomposite solution contains 0.054 g/L gold nanoparticles conjugated with 0.05 wt % poly(*N*-isopropylacrylamide (90 mol %)-co-2-(dimethylamino)-ethyl methacrylate(10 mol %)). The solution was heated at 90 °C for 30 min then cooled at 4 °C for 10 min.



0 1 2 3 4 5 6 7 8 9 10

[homocysteine] / 10^{-6} mol/L

Fig. S6 Photos of effects of the concentration of homocysteine and cysteine on the gold nanocomposite solution.

The data correspond to Fig. 6 in the text.

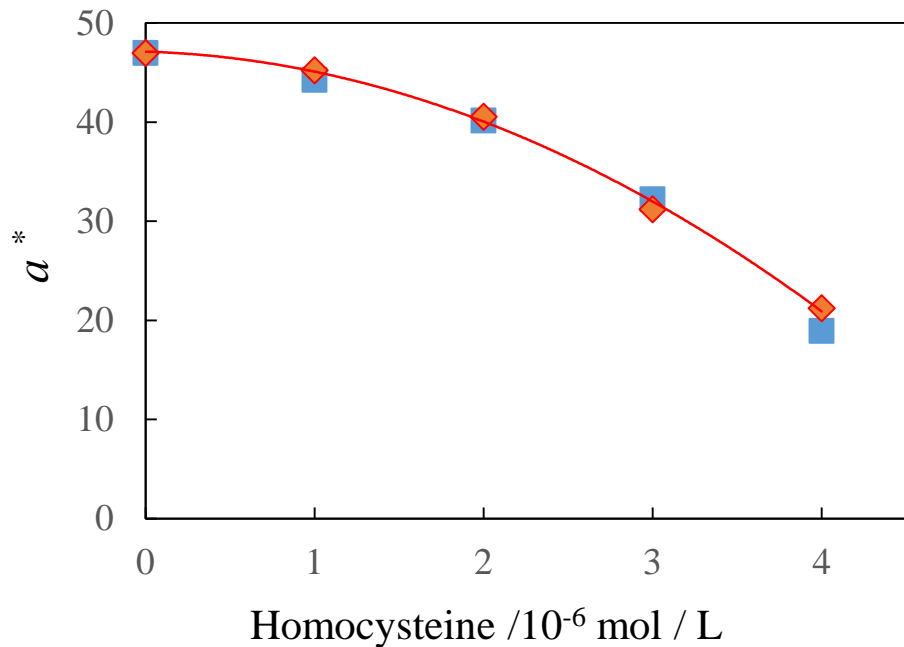


Fig. S7 Relationship between a^* value of a 0.054 g/L gold nanoparticle solution containing 0.05 wt % poly(*N*-isopropylacrylamide (90 mol %)-co-2-(dimethylamino)-ethyl methacrylate (10 mol %)) and concentration of homocysteine.

(\blacklozenge), in a standard solution and (\blacksquare), in a bovine serum sample.

Table S1 Content of DMAEMA in poly (NIPAAm-co-DMAEMA)

Thermo-responsive polymers		DMAEMA / mol%
poly (NIPAAm-co-DMAEMA) (90 : 10)	fed	10
	found	5.7
poly (NIPAAm-co-DMAEMA) (80 : 20)	fed	20
	found	11.9
poly (NIPAAm-co-DMAEMA) (75 : 25)	calculated	25
	found	12.9
poly (NIPAAm-co-DMAEMA) (70 : 30)	calculated	30
	found	15.4
poly (NIPAAm-co-DMAEMA) (60 : 40)	calculated	40
	found	20.6
poly (NIPAAm-co-DMAEMA) (50 : 50)	calculated	50
	found	23.9
poly (NIPAAm-co-DMAEMA) (25 : 75)	calculated	75
	found	35.0

Table S2 Comparison of analytical performance of determination methods of homocysteine with gold nanoparticles

Technique	Linear range	detection limit	Sample	Reference
Colorimetry (Red to blue)	0.2 – 0.5 μM	95.2 nM	N.A.	[31]
Spectrophotometry (Red to blue)	0.05 – 5 μM	10.9 nM	N.A.	[31]
Mass spectrometry	N.A.	34 nM	Plasma	[35]
Post-column HPLC (aggregation)	5-43 μM	3 μM	Plasma, Urine	[30]
Spectrophotometry (Red to blue)	0.2 – 3.0 μM	0.15 μM	Plasma, Urine	[33]
Post-column HPLC (CL detection)	0.02 – 0.5 μM	0.6 nM	Plasma, Urine	[36]
Light scattering (aggregation)	0.08 - 6.0 μM	0.04 μM	Urine	[37]
Post-column HPLC (aggregation)	5.0-50 μM	0.24 μM	Urine	[38]
Spectrophotometry (Red to blue)	1.0 – 4.0 μM	N.A.	Plasma, Urine	[39]