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## **Electronic Supplementary Information**

# Colorimetric detection of $Cr^{3+}$ ions in aqueous solution using poly( $\gamma$ -glutamic

### acid)-stabilized gold nanoparticles

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#### **Part of Experimental Details :**

#### Materials

 $\gamma$ -PGA (Mw = 1000 kDa) was purchased from Nanjing Saitesi Co., Ltd. (Nanjing, China). All other chemicals were obtained from Aldrich (St. Louis, MO) and used as received. The water used in all the experiments was purified using a Milli-Q Plus 185 water purification system (Millipore, Bedford, MA) with a resistivity higher than 18 M $\Omega$ ·cm. Regenerated cellulose dialysis membranes (molecular weight cut-off, MWCO = 14000) were acquired from Fisher (Pittsburg, PA).

#### **Characterization techniques**

UV-vis absorption spectra were recorded using a Lambda 25 UV-vis spectrophotometer (Perkin-Elmer, Waltham, MA). Transmission electron microscopy (TEM) images of  $\gamma$ -PGA-Au NPs were collected using a JEOL 2010F analytical electron microscope (JEOL, Tokyo, Japan) operating at 200 kV. A TEM sample was prepared by dropping NP aqueous suspension (0.05 mg/mL) onto a carboncoated copper grid and air dried before measurements. The size distribution histogram of the Au NPs was analyzed by ImageJ software (http://rsb.info.nih.gov/ij/download.html). Inductively coupled plasma-optical emission spectroscopy (ICP-OES, Leeman Prodigy, Hudson, NH) was used to quantify the Au content in the  $\gamma$ -PGA-Au NPs.

**Table S1.** Hydrodynamic sizes of  $\gamma$ -PGA-Au NPs after exposure to Cr<sup>3+</sup> ions with different concentrations.

Cr <sup>3+</sup> (ppb)	0	5	10	20	30	40	50	60	70	80	90	100
Size (nm)	36.9	51.7	72.0	74.7	78.7	79.0	89.8	112.9	128.7	148.4	180.6	221.6

**Table S2.** The sensing of  $Cr^{3+}$  ions in different water samples by  $\gamma$ -PGA-Au NPs. Data were obtained according to the correlation between SPR peak intensity and  $Cr^{3+}$  ion concentration.

Samples	Detection	Added	Found	Recovery	
	(ppb)	(ppb)	(ppb)	(%)	
Tap water	Not found	50.0	41.0	82.0	
Mineral water	Not found	50.0	47.6	95.2	
Lake water	Not found	50.0	50.2	100.51	
River water	Not found	50.0	44.8	89.5	



Fig. S1 Plots of the time-dependent absorbance (A519) of  $\gamma$ -PGA-Au NPs (200  $\mu$ L, 0.2  $\mu$ g/mL) in the presence of Cr<sup>3+</sup> ions with different concentrations.