

Supporting Information for

**Multifunctional Gold Nanoparticle Layers for Controllable Capture  
and Release of Protein**

Zhenhua Li,<sup>a</sup> Feng Liu,<sup>a</sup> Yuqi Yuan,<sup>a</sup> Jingxian Wu,<sup>a</sup> Hongwei Wang,<sup>\*a</sup> Lin Yuan<sup>\*a</sup> and Hong  
Chen<sup>a</sup>

*<sup>a</sup>. State and Local Joint Engineering Laboratory for Novel Functional Polymeric Materials,  
College of Chemistry, Chemical Engineering and Materials Science, Soochow University, 199  
Ren'ai Road, Suzhou 215123, P. R. China.*

\*Corresponding author:

Lin Yuan, E-mail: yuanl@suda.edu.cn, Tel: +86-512-65880567

Hongwei Wang, E-mail: wanghw@suda.edu.cn, Tel: +86-512-65880567

## **Methods**

### **Preparation of FITC-PPase**

0.5 M Na<sub>2</sub>CO<sub>3</sub> and NaHCO<sub>3</sub> solutions were mixed (v : v = 1 : 9) together, the pH of which was adjusted to alkaline conditions (pH ≈ 9.0). 0.15 M NaCl solution was mixed with the above alkaline solution (v : v = 1 : 9) to dilute the PPase to 1 mg/mL. Fluorescein isothiocyanate (FITC) was dissolved in DMSO (1 mg/mL). The PPase and FITC solutions were mixed (protein : FITC = 1 mg : 150 µg) slowly and further react for 8 h in dark a room. The resulting solution was dialysed in PBS (pH = 7.4) 8 times to remove excess FITC. The FITC-labeled protein was stored in the dark in PBS.

### **Preparation of PMAA-*co*- Fluorescein *O*-methacrylate**

Thiol functionalized PMAA and fluorescein *O*-methacrylate functionalized PMAA was synthesized via a similar procedure as described in the article, except the weight ratio between PMAA and fluorescein *O*- methacrylate was 50:1 for the synthesis of fluorescein *O*- methacrylate functionalized PMAA.

### **Characterization of AuNP, AnNP-PPase, AuNP-PPase-PMAA Conjugates by Energy Dispersive X-ray Spectroscopy (EDX)**

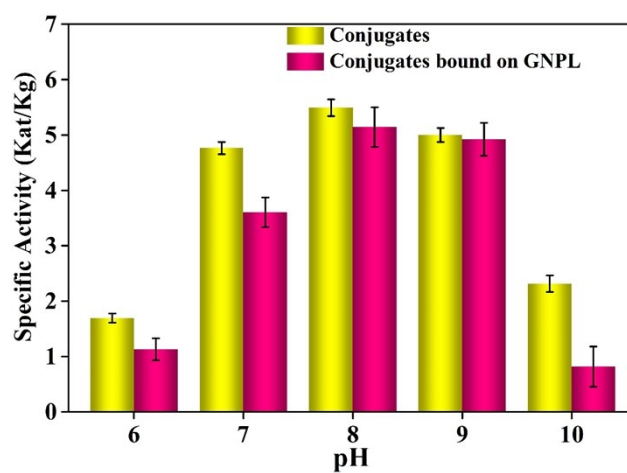
The preparation of AuNP, AuNP-PPase and AuNP-PPase-PMAA is as described in the article. Then, it was centrifuged at 12000g in Eppendorf centrifuge at 5810R for 25 min and rinsed three times to ensure complete removal of excess PPase and PMAA. Next, three different nanoparticles were added to a Si surface (0.5 cm × 0.5 cm), and dried at room temperature. Finally, EDX was characterized by SEM.

### **Characterization of AuNP, AnNP-PPase, AuNP-PPase-PMAA Conjugates by Inverted Fluorescence Microscope**

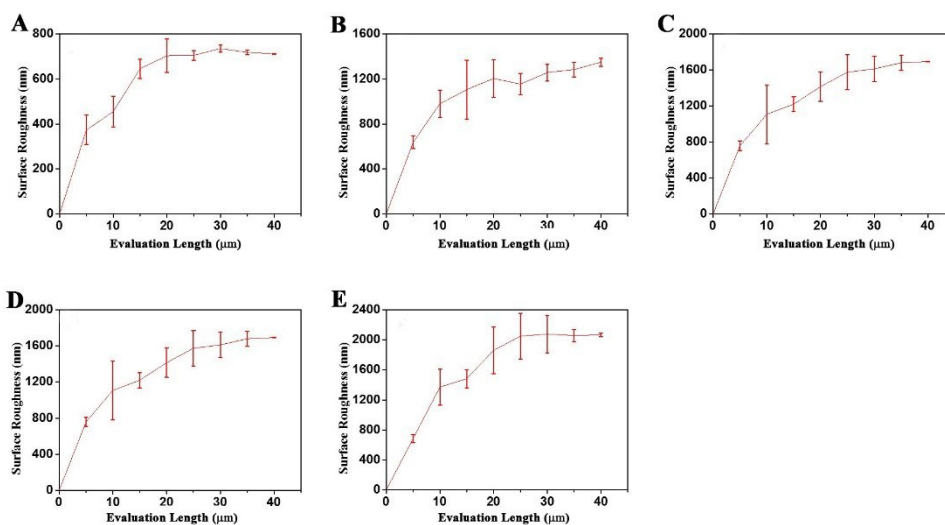
AuNP, AuNP-PPase and AuNP-PPase-PMAA were prepared as described in the article, except formed by fluorescence-labeled PPase and polymer. They were then centrifuged at 12000g in an Eppendorf centrifuge at 5810R for 25 min and rinsed three times to ensure complete removal of excess PPase and PMAA. Images were captured by an Olympus IX71 fluorescence microscope. The images were analyzed using Image-Pro Plus 6.0 software (public software from Media Cybernetics, <http://www.mediacy.com/>).

**Table S1.** The GPC result of PDMAEMA-SH and PMAA-SH.

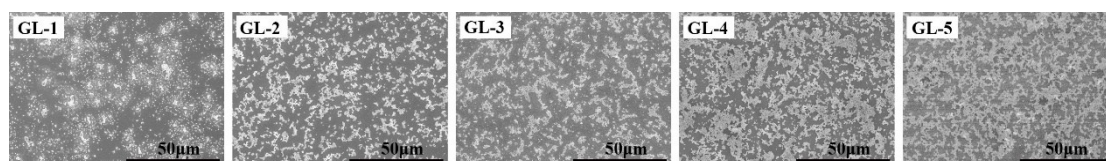
Samples	$[M]_0/[CTA]_0/[I]_0$	Mn, by GPC	PDI
PDMAEMA-SH	300/1/0.25	21100	1.14
PMAA-SH	200/1/0.5	11500	1.16



**Figure S1.** Specific activity of conjugate and conjugate bound on GNPL-PDMAEMA at different pH.



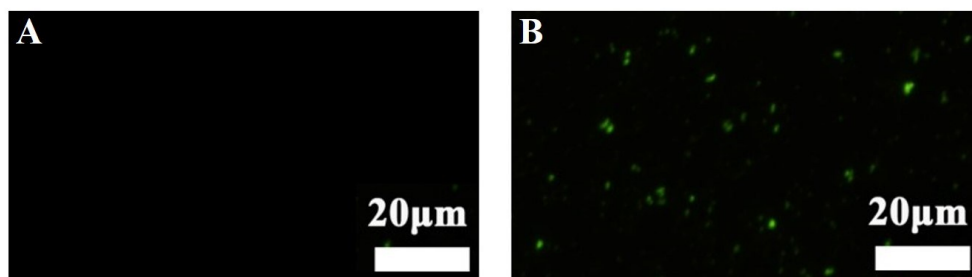
**Figure S2.** (A-E), Plot of roughness vs. evaluation length for GL-1, GL-2, GL-3, GL-4 and GL-5 to describe the topography and provide the roughness parameters Ra using AFM. For each GNPL sample, the evaluation length was 5, 10, 12, 15, 20, 25, 30, 35, and 40 μm, respectively. Data are the mean ± SD ( $n = 3$ ).



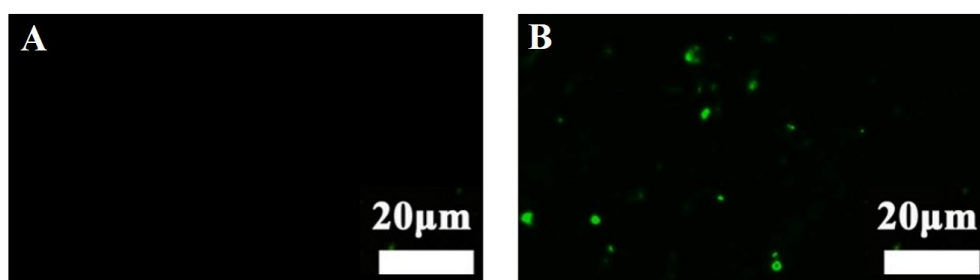
**Figure S3.** Surface characterization of GNPLs by SEM. The volume of the plating solution for GNPL 1-5 are as follows: 80 μL, 160 μL, 250 μL, 300 μL and 400 μL respectively. (scale bar: 50 μm)

**Table S2.** The EDX result of AuNP, AuNP-PPase and AuNP-PPase-PMAA.

Samples	C (weight %)	N (weight %)	O (weight %)	Au (weight %)
AuNP	8.6	3.8	0	87.6
AuNP-PPase	9.5	4.1	4.2	82.1
AuNP-PPase-PMAA	12.0	4.3	3.7	80.0



**Figure S4.** Fluorescence detection by inverted fluorescence microscope. (A) AuNP, (B) AuNP-PPase (FITC-labeled).



**Figure S5.** Fluorescence detection by inverted fluorescence microscope. (A) AuNP, (B) AuNP-PPase-PMAA (*O*-methacrylate -*co*-polymerized).