Electronic Supplementary Material (ESI) for Journal of Material Chemistry B.
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Electronic Supplementary Information

A Reusable Supramolecular Platform for the Specific Capture and Release of Proteins and Bacteria

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S1. Materials

Poly (allylamine hydrochloride) (PAH, M_w = 120,000 to 200,000 g/mol) was purchased from Alfa Aesar (China) Chemicals Co., Ltd. Poly(acrylic acid), copolymer of adamantane and acrylic acid (P(AA-co-Ada)) and β-cyclodextrin-$(mannose)_7$ (CD-M) were synthesized according to our previous work.[1] Cysteamine hydrochloride (98%) was obtained from Sigma-Aldrich Chem. Co. and used as received. All organic solvents were purchased from Sinopharm Chemical Reagent Co. (Shanghai, China) and purified according to standard methods before use. The deionized water used in all experiments was purified using a Millipore water purification system to a minimum resistivity of 18.2 MΩ·cm. The nitrogen gas was of high-purity grade. Gold-coated silicon wafers (80 nm Au on a 10 nm chromium adhesion layer) were cut into 0.5 × 0.5 cm^2 pieces.

Concanavalin A (ConA) and bovine serum albumin (BSA) were obtained from Sigma. Fluorescein isothiocyanate (FITC)-labeled Concanavalin A (FITC-ConA) was obtained from Sigma. Fluorescein isothiocyanate (FITC)-labeled bovine serum albumin (FITC-BSA) was obtained from Solarbio.

Escherichia coli (*E. coli,* ATCC-700926) and *S. aureus* (*S. aureus,* ATCC-6538) were used in our experiments. Prior to the experiments, the bacteria were incubated in Luria-Bertani broth medium (LB, Sigma-Aldrich), grown overnight under shaking at 37°C, and harvested during the exponential growth phase via centrifugation. The supernatant was then discarded, and the cell pellet was re-suspended in phosphate-buffered saline (PBS, pH 7.4). The final concentration of bacteria was adjusted to approximately 1×10^7 cells·mL^{-1} before use.

S2. Statistical Analysis

Each experiment was performed independently at least in duplicate and quantified at least in

triplicate. The results are expressed as the mean ± standard error for each sample. The statistical analysis was performed using Origin Pro 8.6 software. One-way analysis of variance (ANOVA, *t*-test) was used to compare the data obtained from different samples under identical treatments. A difference with a *p*-value of less than 0.05 was considered statistically significant.

S3. Surface Characterization

S3.1. Surface Morphology

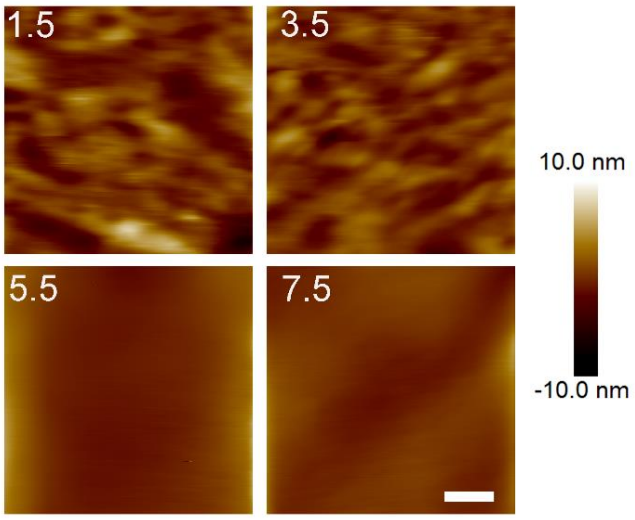

Fig. S1 AFM images of various number of bilayers.

S3.2. Surface Elementary Composition and Layer Thickness

Table S1 Elementary composition and thickness of Au surfaces during each modification step.

Surface	Elemental composition (%)						Thickness[a)]
	Au	S	C	N	O	Cl	(nm)
Au	60.4	N.D	29.0	N.D	10.6	N.D.	N.D.
Au-NH_2	54.6	4.3	22.6	5.4	13.1	N.D.	0.5±0.1
Au-LbL[b)]	N.D.	0.8	57.9	6.5	33.8	1.0	49.1±0.3
Au-LbL(CD-M)[b)]	N.D.	N.D.	57.7	13.2	28.5	0.6	51.3±0.4

a) Data are mean ± standard error (n = 3).

b) The number of bilayers is 7.5.

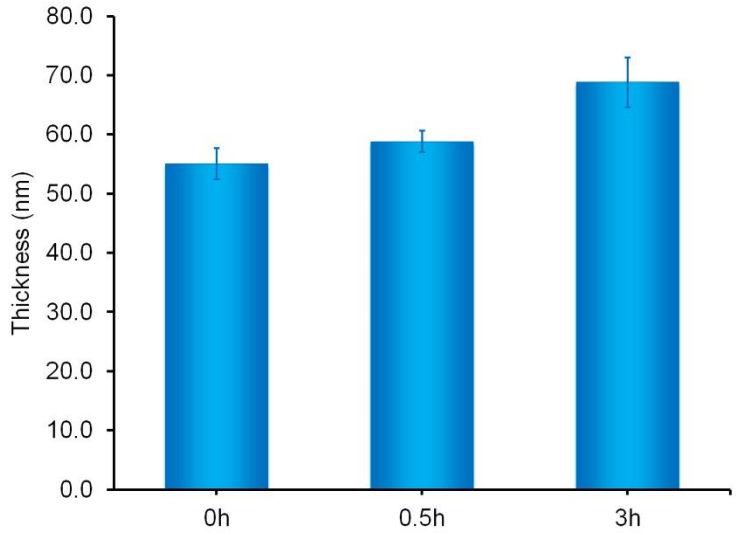

Fig. S4 Change in thickness of Au surfaces with 7.5 bilayers of P(AA-co-Ada)/PAH before and after incubation in SDS for different time periods. Error bars represent the standard deviation of the mean (n = 6).

S4. Adsorption/Desorption of ConA and Attachment/Detachment of *E. coli*

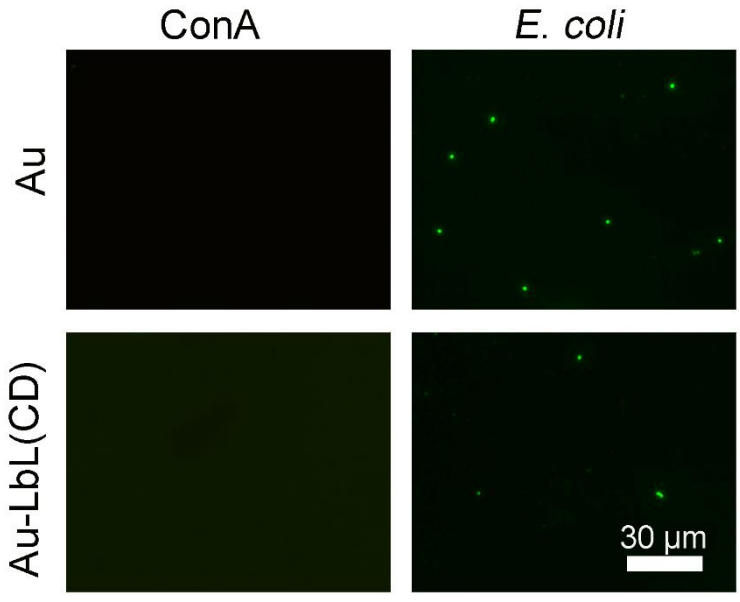

Fig. S2 Representative fluorescence images of adsorbed FITC-ConA (left) and attached *E. coli* (right) on an unmodified Au surface and a Au surface with 7.5 bilayers of P(AA-co-Ada)/PAH with adsorbed

β-CD (Au-LbL(CD)). These surfaces were incubated in either 0.1 mg/mL FITC-ConA or a suspension of *E. coli* (1×10^7 cells·mL^{-1}) for 3 h.

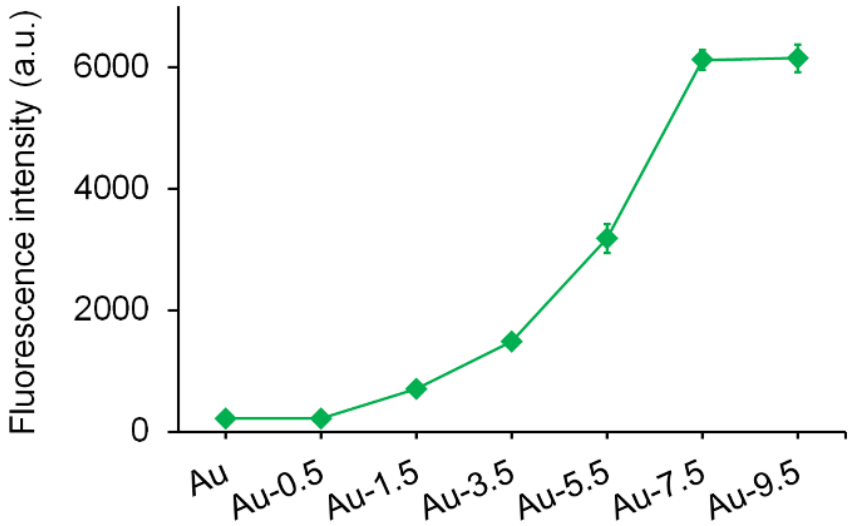

Fig. S3 Adsorption of 0.1 mg/mL of FITC-ConA on Au surfaces with varying numbers of deposited P(AA-co-Ada)/PAH bilayers after incorporating CD-M. Error bars represent the standard deviation of the mean (n = 3).

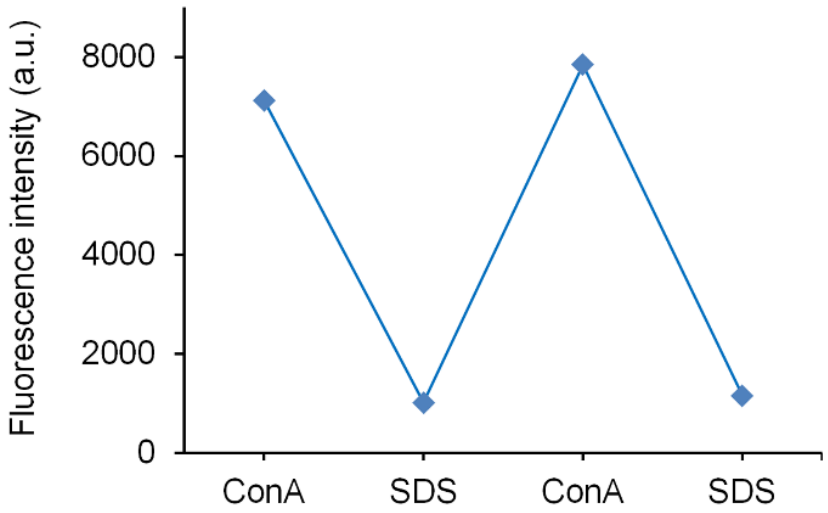

Fig. S5 Adsorption and desorption of ConA on P(AA-co-Ada)/PAH multilayered films for two cycles. Error bars represent the standard deviation of the mean (n = 3).

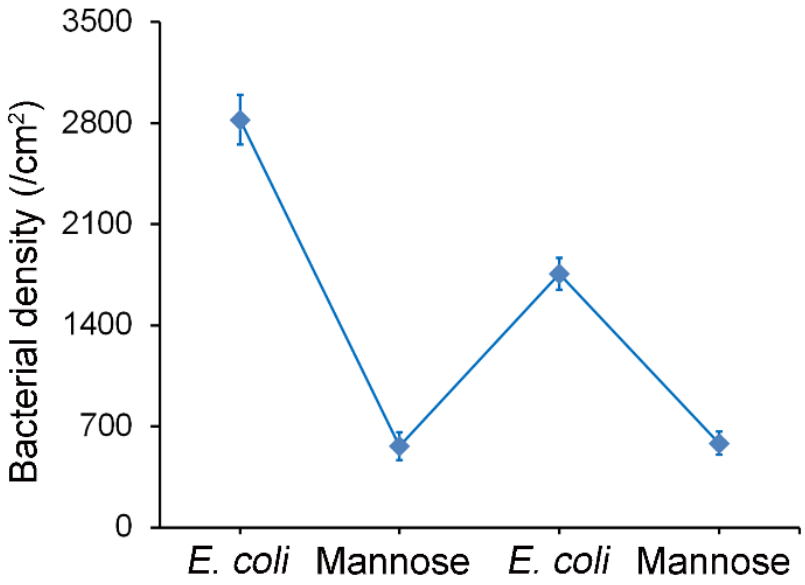

Fig. S6 Attachment and detachment of *E. coli* on P(AA-co-Ada)/PAH multilayered surfaces for two cycles. Error bars represent the standard deviation of the mean (n = 3).

Reference

1. L. Cao, Y. Qu, C. Hu, T. Wei, W. Zhan, Q. Yu and H. Chen, *Adv. Mater. Interfaces*, 2016, 1600600.