

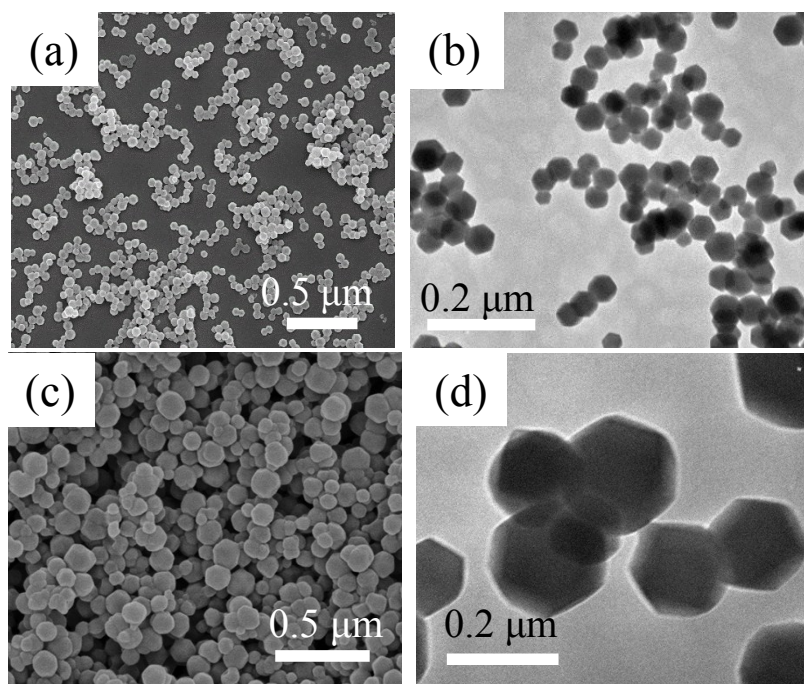
## Supporting Information

### MOF-templated rough, ultrathin inorganic microcapsules for enzyme immobilization

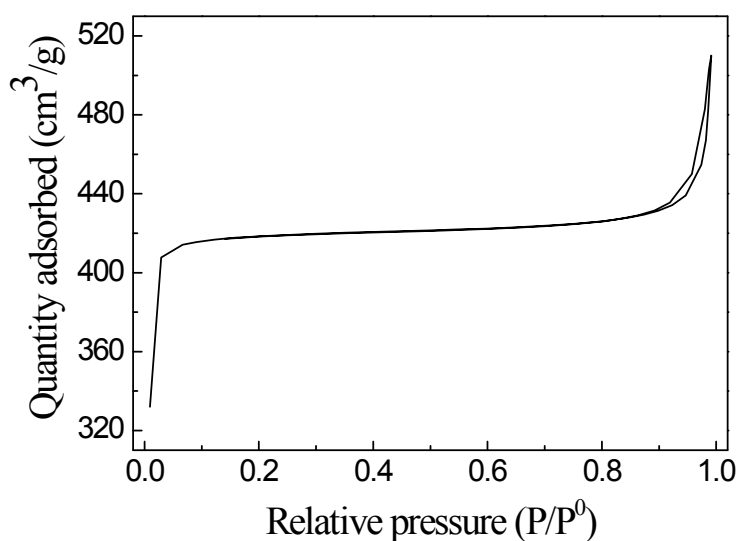
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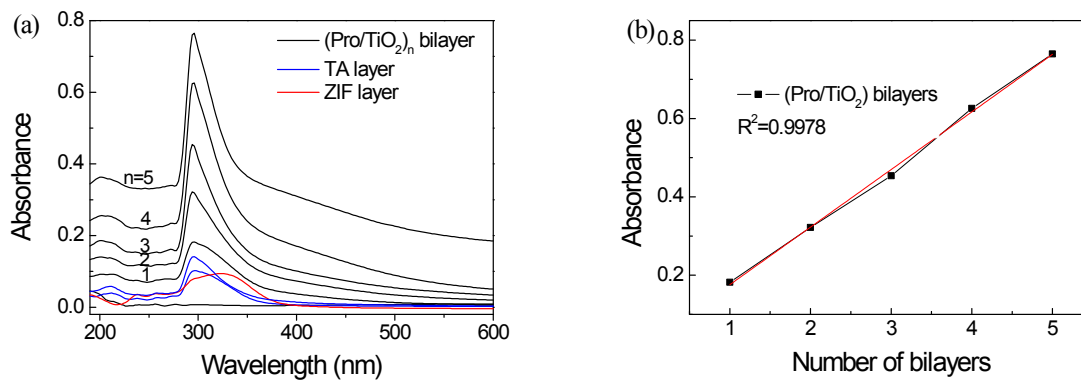


**Figure S1.** SEM and TEM images of the as-synthesized ZIF-8 particles (a, b) ~50 nm, (c, d) ~150 nm.

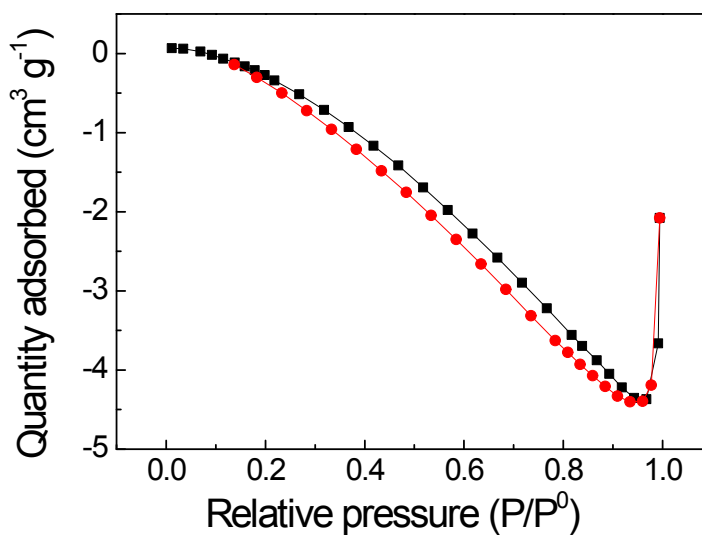


**Figure S2.** Nitrogen adsorption–desorption isotherms of the as–synthesized ZIF-8 particles.

To further confirm the assembly procedure, TA/ZIF-8/TA(Pro/TiO<sub>2</sub>)<sub>n</sub> multilayer film was performed on quartz plate (size 25 mm × 12 mm × 1 mm). Before assembly, quartz plates were cleaned with RCA cleaning solution (5:1:1 H<sub>2</sub>O:H<sub>2</sub>O<sub>2</sub> (30%):NH<sub>3</sub> (25%)) at 60 °C for 60 min, rinsed with deionized water and dried with nitrogen gas. Then, the plates were endowed with –NH<sub>2</sub> functional groups by immersing in 5 mg mL<sup>-1</sup> of PEI solution for 30 min. The pre-coated PEI plates were successively assembled with TA/ZIF-8/TA(Pro/TiO<sub>2</sub>)<sub>n</sub> multilayer architecture. The plates were washed with water and dried with a nitrogen stream after each assembly. UV–vis spectra were scanned after each layer deposition. Figure S3a showed the UV–vis spectra of the TA/ZIF-8/TA(Pro/TiO<sub>2</sub>)<sub>n</sub> multilayer film (n=1–5). The absorbance at 296 nm vs the number of bilayer was plotted in Figure S3b. The growth of the film exhibited a good linear correlation with correlation coefficients of R<sup>2</sup>=0.9978 for assembly of (Pro/TiO<sub>2</sub>) bilayer, suggesting the successful assembly based on biomineralization principle.



**Figure S3.** (a) UV-vis spectra of TA/ZIF-8/TA(Pro/TiO<sub>2</sub>)<sub>n</sub> multilayer film; (b) Optical absorption at  $\lambda_{\max} = 296$  nm for (Pro/TiO<sub>2</sub>)<sub>n</sub> bilayers, n was the bilayer number of (Pro/TiO<sub>2</sub>).



**Figure S4.** Nitrogen adsorption-desorption isotherms of TiO<sub>2</sub> MCs, and the result indicated that the porous structure of TiO<sub>2</sub> MCs can not be determined by the BET analysis.