

## Supporting Information

### **Insight into the tannic acid-based modular assembly strategy on inorganic-biological hybrid systems: material suitability, loading effect and biocompatibility study**

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**5 Tables and 3 Figures included**

**Table S1** Composition of Delft medium

Delft medium	1000 mL
(NH <sub>4</sub> ) <sub>2</sub> SO <sub>4</sub>	5 g
KH <sub>2</sub> PO <sub>4</sub>	3 g
MgSO <sub>4</sub> ·7H <sub>2</sub> O	0.5 g
Glutamic acid	0.5 g
Uracil	0.6 g
*Trace metal solution	1 mL
**Vitamin solution	1 mL
NaOH	Adjust the pH to 6.0
Ultrapure H <sub>2</sub> O	To 1000 mL

Note: Autoclave before use

*Trace metal solution	100 mL
FeSO <sub>4</sub> ·7H <sub>2</sub> O	300 mg
ZnSO <sub>4</sub> ·7H <sub>2</sub> O	450 mg
CaCl <sub>2</sub> ·2H <sub>2</sub> O	450 mg
MnCl <sub>2</sub> ·4H <sub>2</sub> O	100 mg
H <sub>3</sub> BO <sub>3</sub>	100 mg
Na <sub>2</sub> EDTA·2H <sub>2</sub> O	1.9 g
CoCl <sub>2</sub> ·6H <sub>2</sub> O	30 mg
CuSO <sub>4</sub> ·5H <sub>2</sub> O	30 mg
Na <sub>2</sub> MoO <sub>4</sub> ·2H <sub>2</sub> O	40 mg
KI	10 mg
Ultrapure H <sub>2</sub> O	To 100 mL

Note: Filter by 0.22 um membrane before use

**Vitamin solution	100 mL
d-Biotin	5 mg
Thiamin-HCl	100 mg
Pyridoxin-HCl	100 mg
Nicotinic acid	100 mg
4-aminobenzoic acid	20 mg
myo-Inositol	2.5 g
D-Pantothenic acid hemicalcium salt	100 mg
Ultrapure H <sub>2</sub> O	To 100 mL

Note: Filter by 0.22 um membrane before use

**Table S2** Composition of YPD medium

YPD medium	1000 mL
Yeast Extract	10 g
Peptone	20 g
Dextrose	20 g
Ultrapure H <sub>2</sub> O	To 1000 mL

Note: Autoclave before use

**Table S3** XPS elemental analysis diagram of TA-Fe<sup>3+</sup>/M and M.

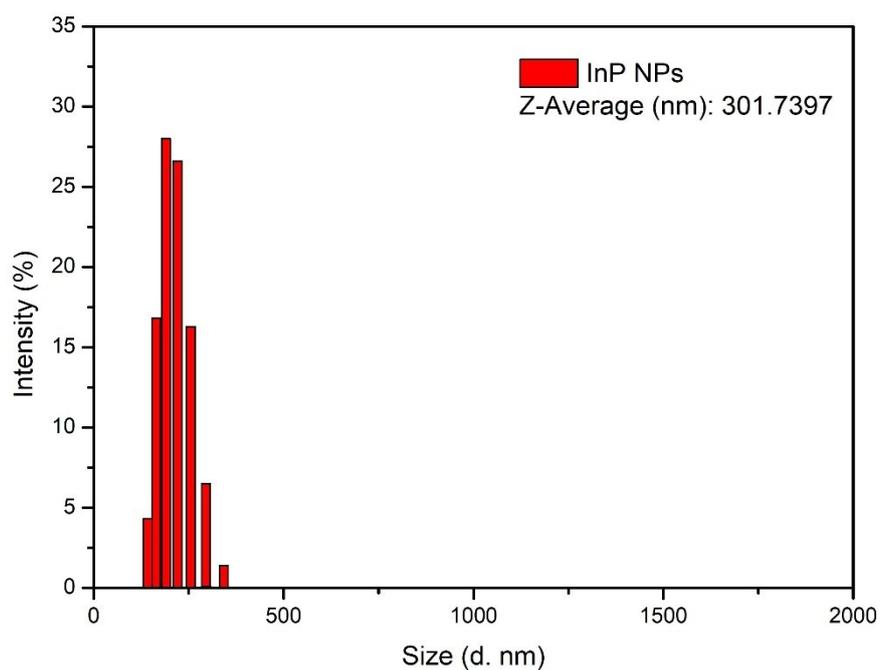
	C 1s	O 1s	Fe 2p	In 3d	P 2p
InP NPs	36.23%	30.51%	0.39%	17.19%	15.67%
TA-Fe <sup>3+</sup> /InP NPs	58.29%	33.03%	0.27%	4.53%	3.89%
	C 1s	O 1s	Fe 2p	Bi 4f	
Bi NSs	50.93%	40.51%	0.01%	8.55%	
TA-Fe <sup>3+</sup> / Bi NSs	62.91%	34.09%	0.45%	2.55%	
	C 1s	O 1s	Fe 2p	N 1s	
g-C <sub>3</sub> N <sub>4</sub>	47.95%	2.12%	0.01%	49.92%	
TA-Fe <sup>3+</sup> / g-C <sub>3</sub> N <sub>4</sub>	51.30%	20.48%	0.30%	27.92%	

**Table S4** EDS elemental analysis diagram of TA-Fe<sup>3+</sup>/g-C<sub>3</sub>N<sub>4</sub> on **Figure 3 L**

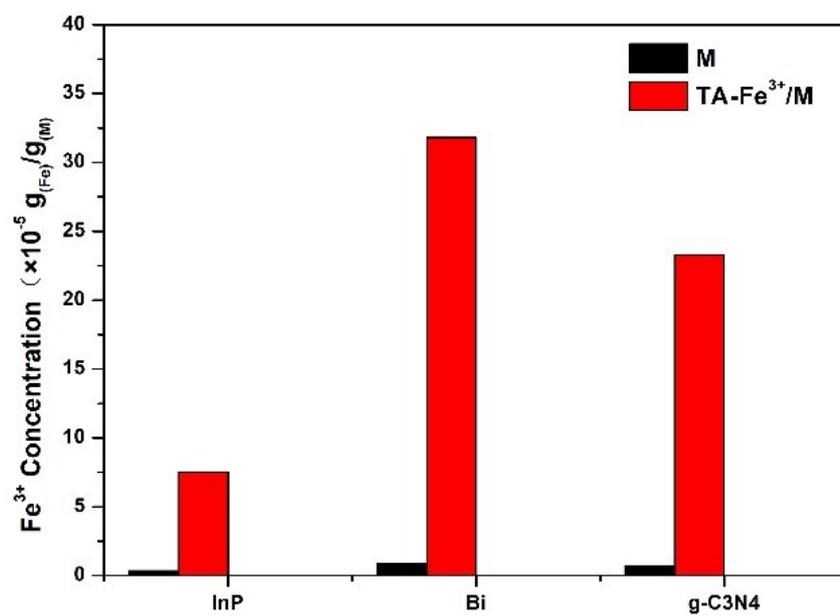
	Atomic percentage (%)			
	C	N	O	Fe
TA-Fe <sup>3+</sup> /g-C <sub>3</sub> N <sub>4</sub>	17.38	1.89	79.45	1.28
TA-Fe <sup>3+</sup> /g-C <sub>3</sub> N <sub>4</sub> /Yeast	59.94	0.00	38.71	1.35

**Table S5** Experimental conditions applied in the processes of TA-Fe<sup>3+</sup> functionalization and modular assembly studies.

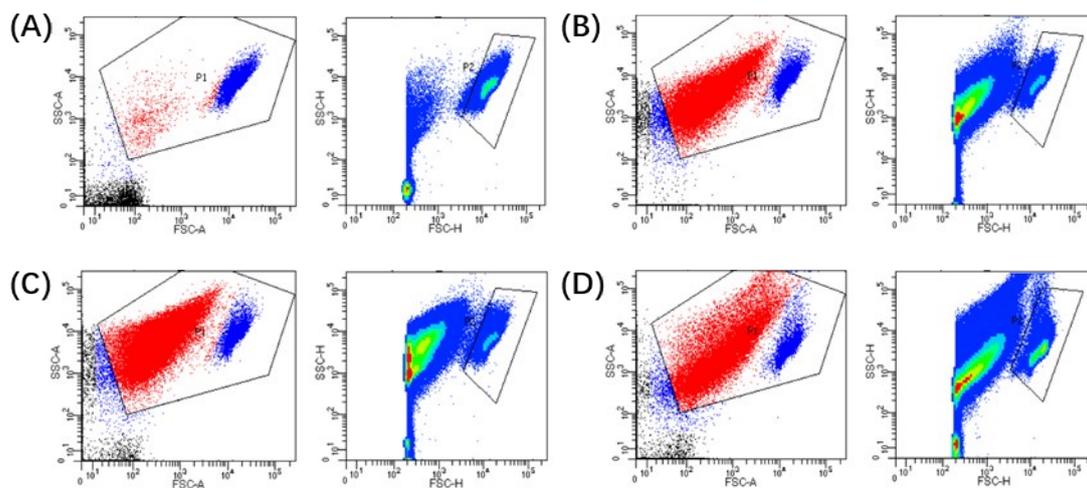
TA-Fe <sup>3+</sup> Functionalization			Modular assembly	
	TA (mg)	M (mg)	OD ratio (TA-Fe <sup>3+</sup> /M to Cell)	Fe <sup>3+</sup> concentration (v/v)
Condition 1	2	50	1:2	1%
			1:1	10%
Condition 2	40	50	1:2	1%
			1:1	10%
Condition 3	40	10	1:2	1%
			1:1	10%



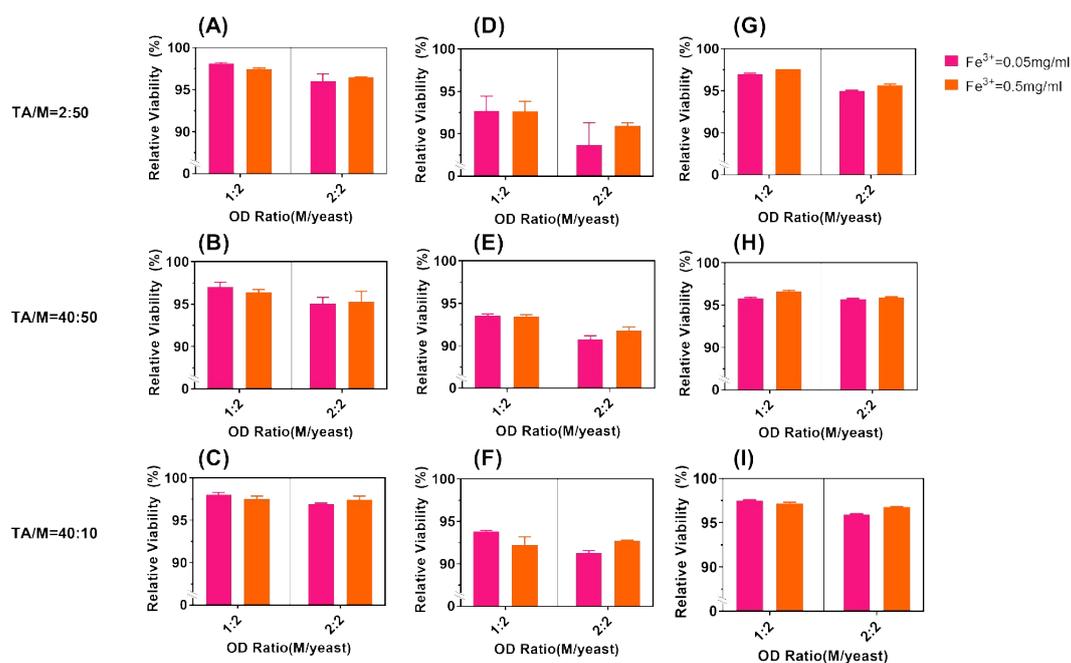
**Figure S1** Particle size distribution histogram of InP NPs.



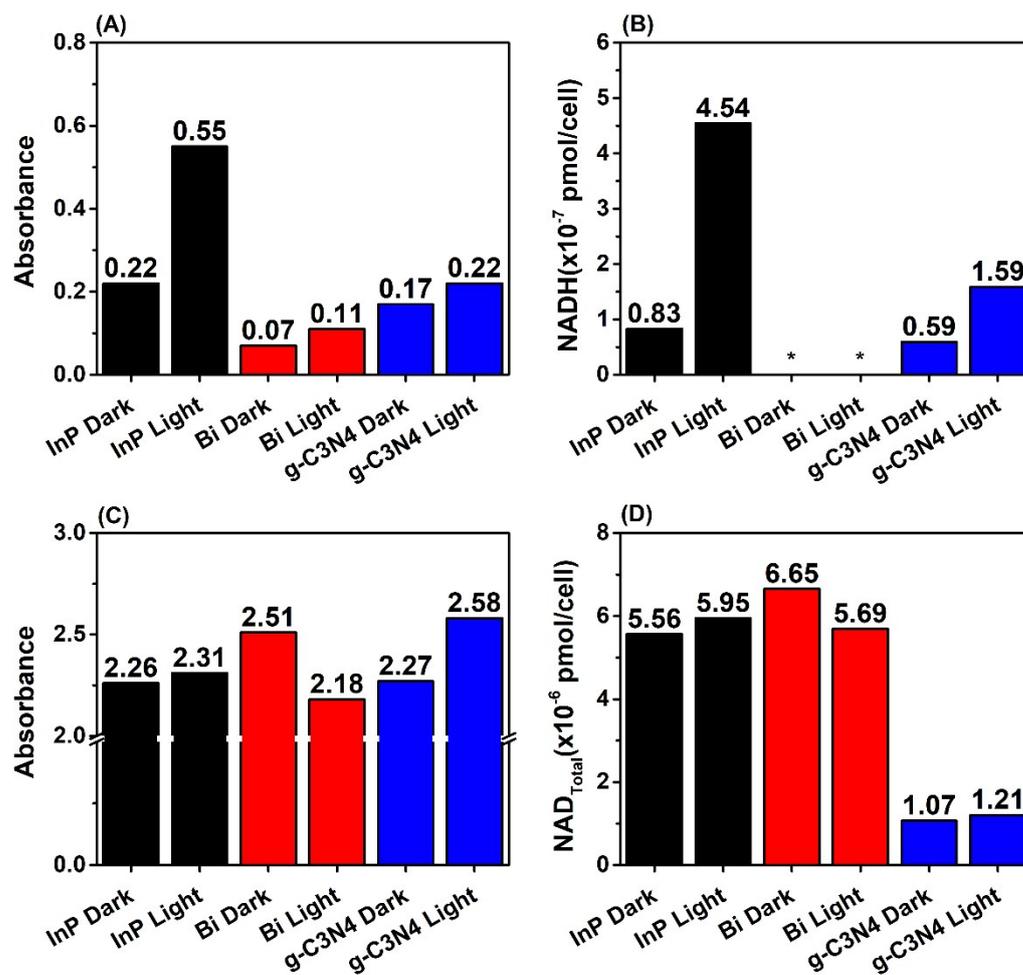
**Figure S2** Fe content ( $\text{g}_{\text{Fe}}/\text{g}_{\text{M}}$ ) of TA-Fe<sup>3+</sup>/M and M measured by ICP/OES.



**Figure S3** Representative flow cytometry results of native yeast cell (A) and the biohybrids of TA-Fe<sup>3+</sup>/InP NPs (B), TA-Fe<sup>3+</sup>/Bi NSs (C), TA-Fe<sup>3+</sup>/g-C<sub>3</sub>N<sub>4</sub> (C). Dots located within the region of P2 were counted to calculate the cell number, and those located outside of the region P2 corresponded to either the nanomaterials or the background noise.



**Figure S4** Relative viabilities of yeast cells in different biohybrid systems and grown for 48 h. Biohybrid systems were those of the TA-Fe<sup>3+</sup>/InP NPs (A, B, C), TA-Fe<sup>3+</sup>/Bi NSs (D, E, F), TA-Fe<sup>3+</sup>/g-C<sub>3</sub>N<sub>4</sub> (G, H, I). Cells were stained with FITC and PI, and the live cells were quantified with flow cytometry. Relative viabilities (%) were calculated as the ratios of cell densities ( $\times 10^6$  cells/mL) between the live cells and all cells in the corresponding biohybrid system.



**Figure S5** Blank-subtracted absorbance measured at 450nm from the samples of NADH (A) and total NAD (C), intracellular levels of NADH (B) and total NAD (D). Samples marked with “\*” were below the calculation limit.