Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A.

Supporting Information

Trifunctional modification of individual bacterial cells for magnet-assisted bioanode with high performance in microbial fuel cells

Yujing Jiang,[a] Pingping Li,[a] Yuanyuan Wang,[a] Li-Ping Jiang,[a] Rong-Bin Song,*[ab] Jian-Rong Zhang*[ac] and Jun-Jie Zhu*[a]

[a] State Key Laboratory of Analytical Chemistry for Life Science, School of Chemistry and Chemical Engineering, Nanjing University, Nanjing 210023, P.R. China

E-mail: rbsong@nju.edu.cn; jrzhang@nju.edu.cn; jjzhu@nju.edu.cn

[b] School of Ecology and Environment, Zhengzhou University, Zhengzhou 450001, P.R. China

E-mail: rbsong@zzu.edu.cn

[c] School of Chemistry and Life Science, Nanjing University Jingling College, Nanjing 210089, P.R. China

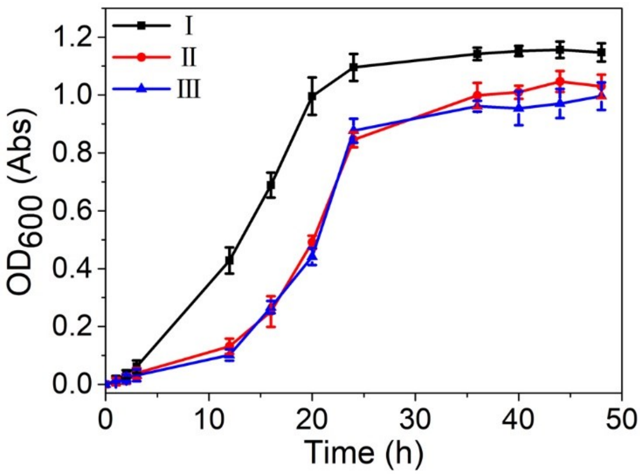

Fig. S1 Growth curves of native *S. oneidensis* MR-1 (curve I), *S. oneidensis* MR-1@Au (curve II) and *S. oneidensis* MR-1@Au@Fe_3O_4 (curve III). Error bars represent standard error (s.e.) determined by three independent experiments.

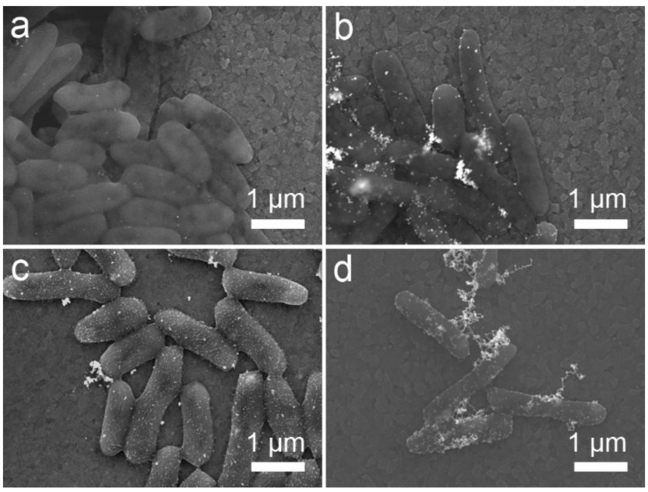

Fig. S2 SEM images of *S. oneidensis* MR-1@Au with different Au content. (a) 0.5 mM L^{-1}, (b) 1 mM L^{-1}, (c) 1.5 mM L^{-1}, (d) 2 mM L^{-1}.

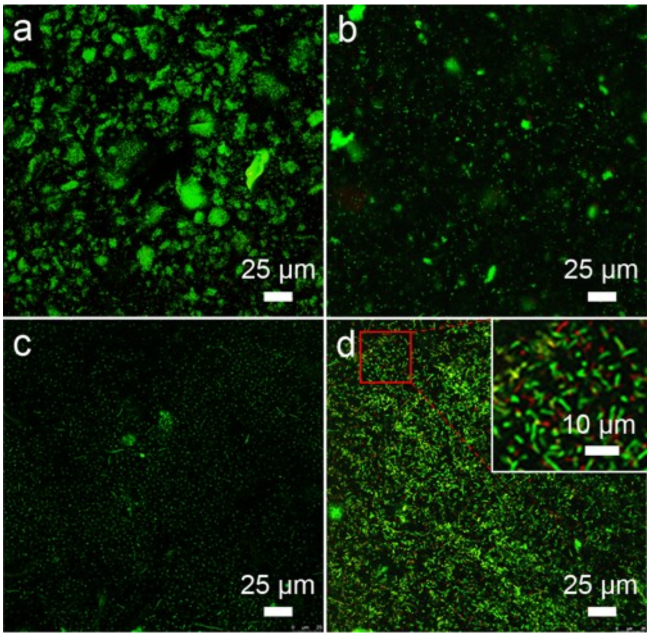

Fig. S3 CLSM images of *S. oneidensis* MR-1@Au with different Au content. (a) 0.5 mM L^{-1}, (b) 1 mM L^{-1}, (c) 1.5 mM L^{-1}, (d) 2 mM L^{-1}. The inset in image d is the corresponding high-magnification CLSM image.

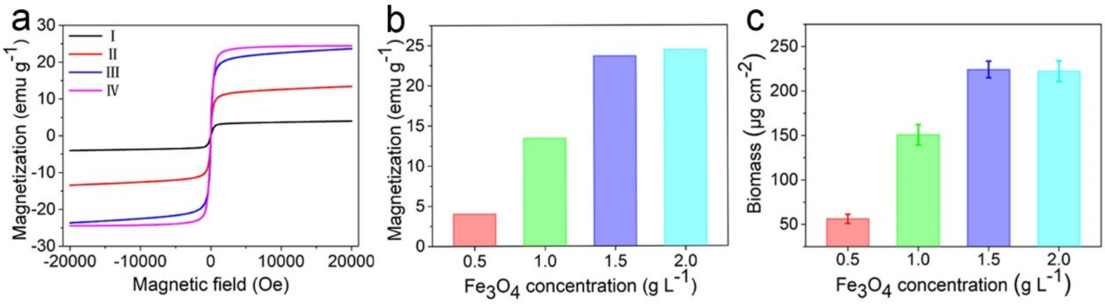

Fig. S4 The hysteresis loops (a), saturation magnetization (b) and biomass (c) of *S. oneidensis* MR-1@Au@Fe_3O_4 at different Fe_3O_4 concentration (curve I, 0.5 g L^{-1}; curve II, 1 g L^{-1}; curve III, 1.5 g L^{-1}; curve IV, 2 g L^{-1}).

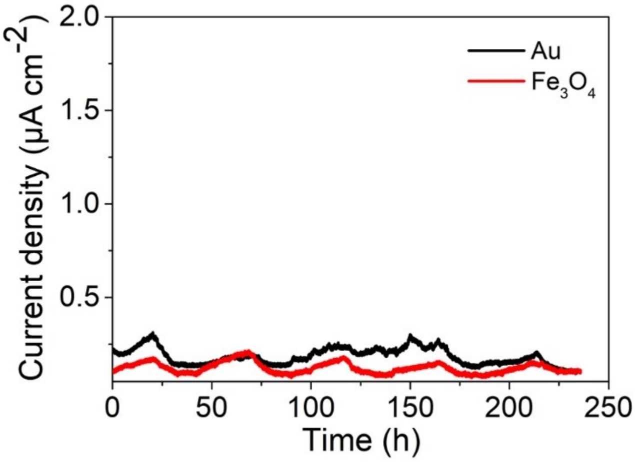

Fig. S5 Time profile of electricity generation of magnetic substrate electrode with Au and Fe_3O_4.

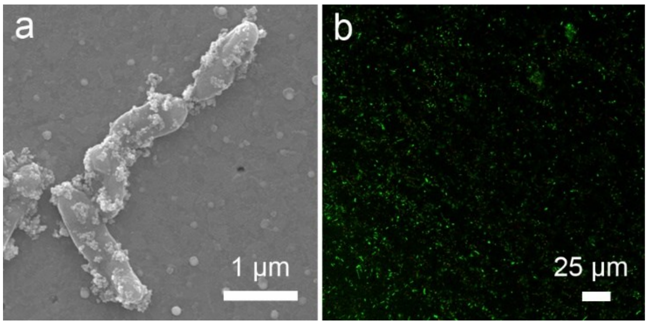

Fig. S6 SEM image (a) and CLSM image (b) of *S. oneidensis* MR-1@Fe_3O_4 after modification.

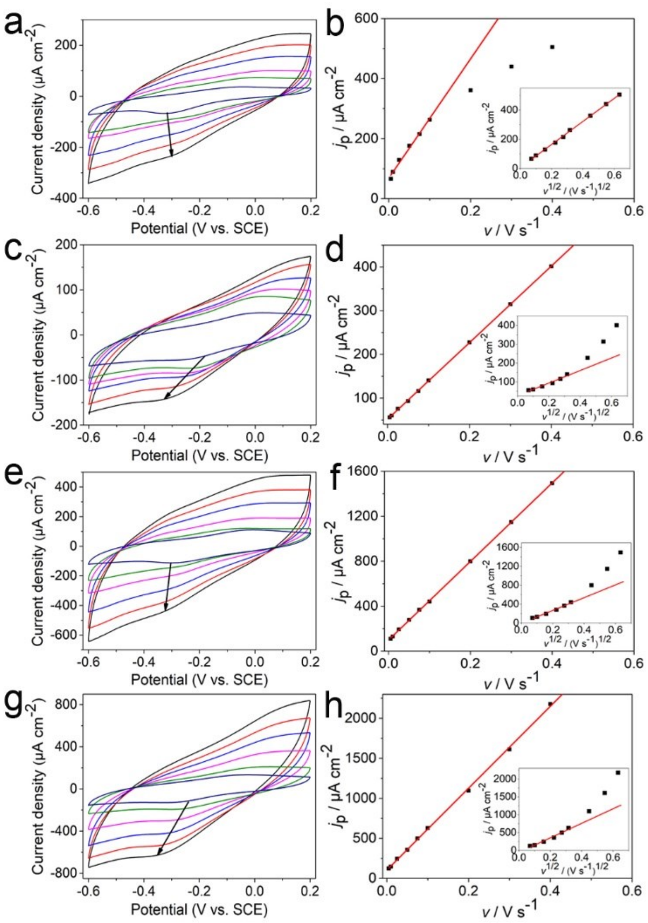

Fig. S7 Cyclic voltammograms of *S. oneidensis* MR-1 (a), *S. oneidensis* MR-1@Au (c), *S. oneidensis* MR-1@Fe_3O_4 (e) and *S. oneidensis* MR-1@Au@Fe_3O_4 (g) biofilms at different scan rates (arrows showed scan rates at 5,10, 25, 50, 75 and 100 mV s^{-1}, respectively). Dependence of reduction current density (j_p) versus scan rate (v) on *S. oneidensis* MR-1 (b), *S. oneidensis* MR-1@Au (d), *S. oneidensis* MR-1@Fe_3O_4 (f) and *S. oneidensis* MR-1@Au@Fe_3O_4 (h) biofilms, separately; Inset: linear dependence of j_p versus $v^{1/2}$.

Table S1. Comparison of the performance of previous MFCs using Au, Fe_3O_4 and their corresponding hybrids as anodes, as well as functionalized bacterial cells as bioanode.

Electrode substrates	**Anode materials**	**Microbe type**	**Power density** (mW m^{-2})	**Ref.**
Graphite felt	Fe_3O_4	Mixed bacteria	18.28	1
Carbon felt	MWCNT-Au-Pt/ osmium redox polymer	*Gluconobacter oxydans*	32.1	2
Carbon cloth	BioAu/MWCNT	Mixed bacteria	178.34 ± 4.79	3
Carbon paper	Au	Mixed bacteria	461.6	4
Stainless steel mesh	Activated carbon/ Fe_3O_4	Mixed bacteria	809 ± 5	5
Carbon paper	Fe_3O_4/CNT	*Escherichia coli*	830	6
Carbon paper	Fe_3O_4/CNT	*Escherichia coli*	865	7
Carbon paper	Graphene/Fe_3O_4	*Shewanella oneidensis*	891	8
Carbon paper	Au	Mixed bacteria	990	9
Stainless steel plates	Fe_3O_4/Fe_2O_3	*Geobacter sulfurreducens*	1500	10
Carbon felt	/	Polydopamine-coated *Shewanella xiamenensis*	452.8	11
Carbon cloth	/	Polypyrrole-coated *Shewanella oneidensis*	1479	12
Carbon felt	/	Carbon dots-coated *Shewanella oneidensis*	1697.9	13
Carbon cloth	/	**Au and Fe_3O_4-coated *Shewanella oneidensis***	**1792**	**This work**

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