Supporting Information

Immobilization of laccase on Fe_3O_4@MF-CNTs for the rapid and sensitive biosensing of catechol

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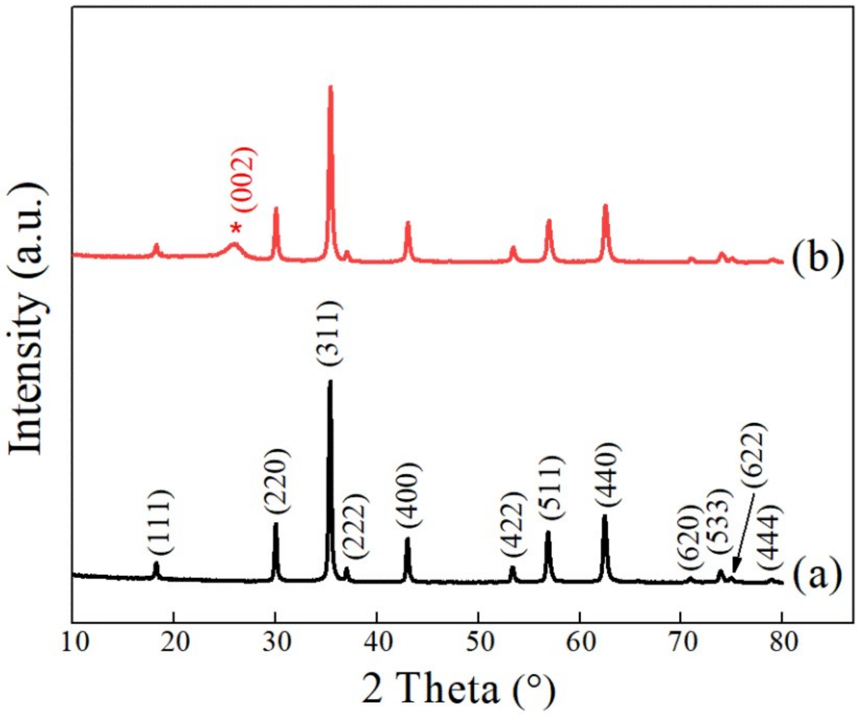

Fig. S1. XRD patterns of (a) Fe_3O_4@MF nanoparticles and (b) Fe_3O_4@MF-CNTs nanocomposites, the * signalled hexagonal carbon.

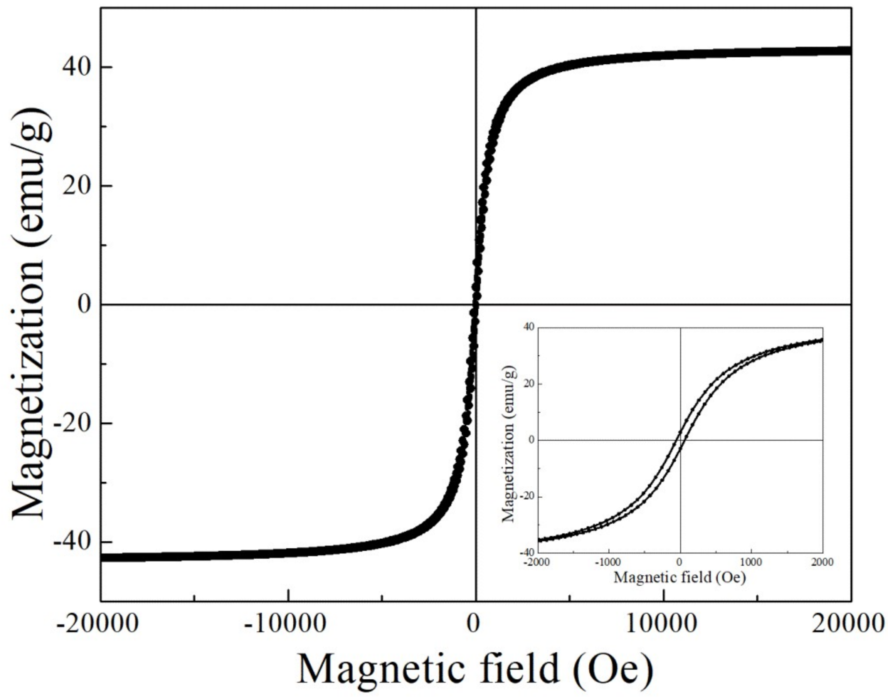

Fig. S2. Magnetic hysteresis loop of Fe_3O_4@MF-CNTs nanocomposites at 300 K.

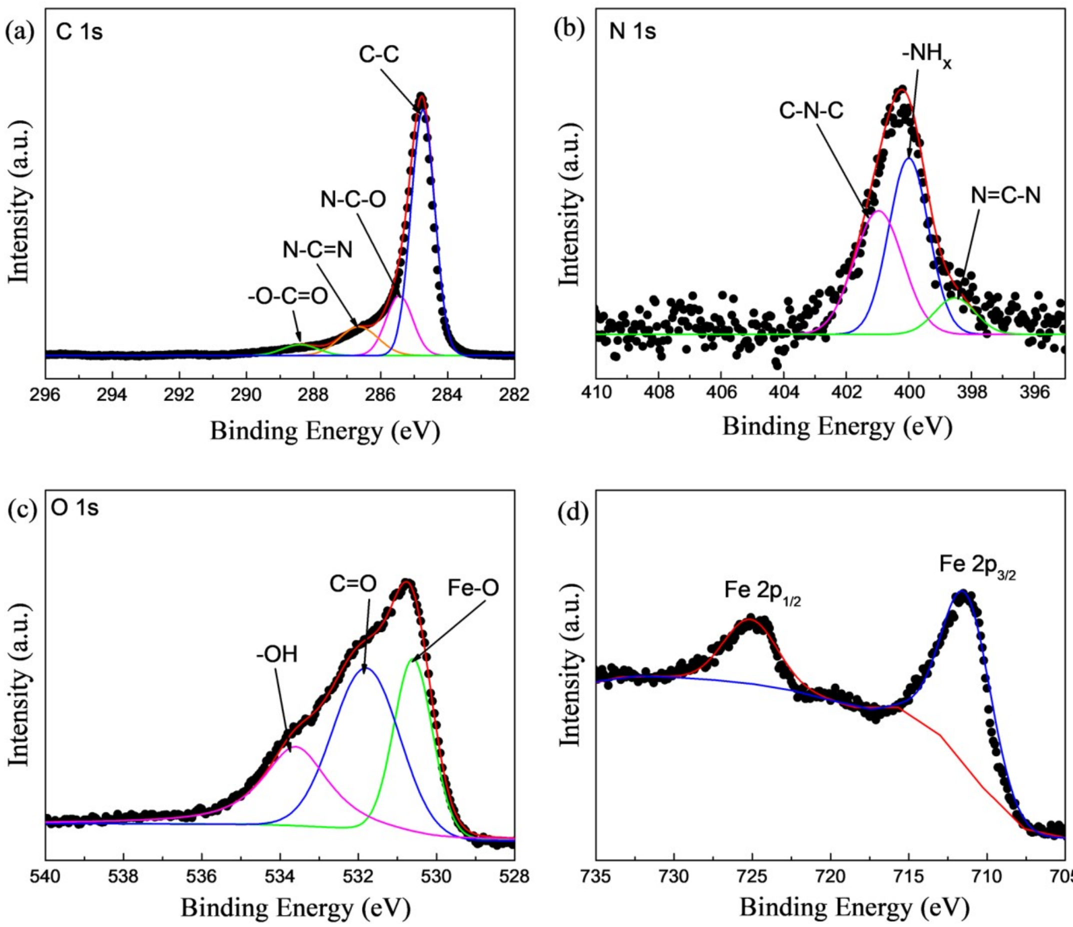

Fig. S3. (a) C 1s, (b) N 1s, (c) O 1s and (d) Fe 2p XPS spectra of Fe_3O_4@MF-CNTs nanocomposites.

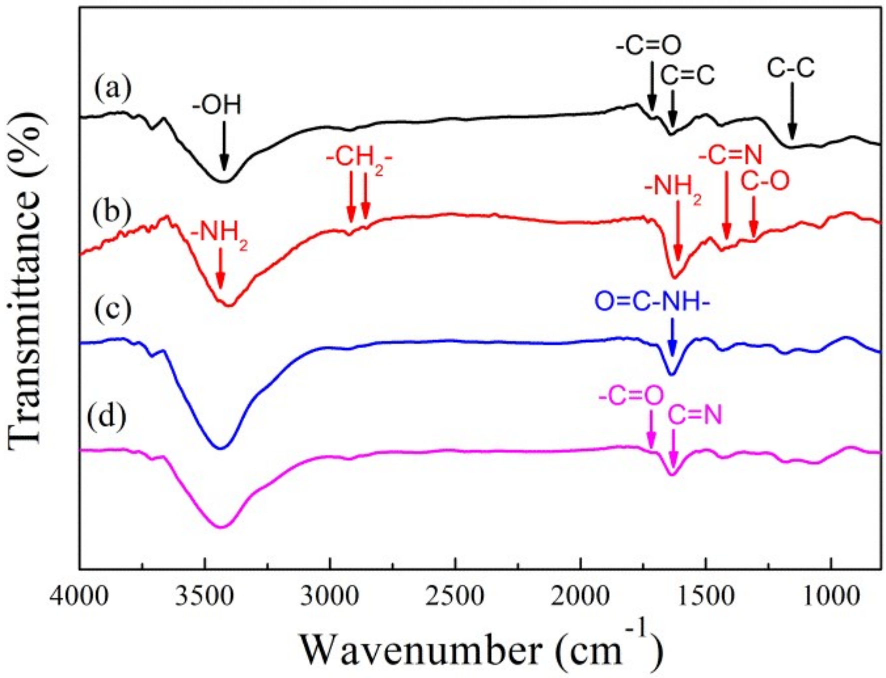

Fig. S4. FT-IR spectra of (a) CNTs-COOH, (b) amino-functionalized Fe_3O_4@MF nanoparticles, (c) amino-functionalized Fe_3O_4@MF-CNTs nanocomposites and (d) aldehyde-functionalized Fe_3O_4@MF-CNTs nanocomposites.

Table S1. Effective surface areas of bare GCE, Fe_3O_4@MF and Fe_3O_4@MF-CNTs electrodes.

Electrode	Randles's slope/μA/(mV/s)$^{1/2}$	Effective areas/cm^{-2}
Bare GCE	19.99 ± 0.23	0.1755±0.0020
Fe_3O_4@MF	21.19± 0.16	0.1839±0.0014
Fe_3O_4@MF-CNTs	29.54 ± 0.25	0.2563±0.0022

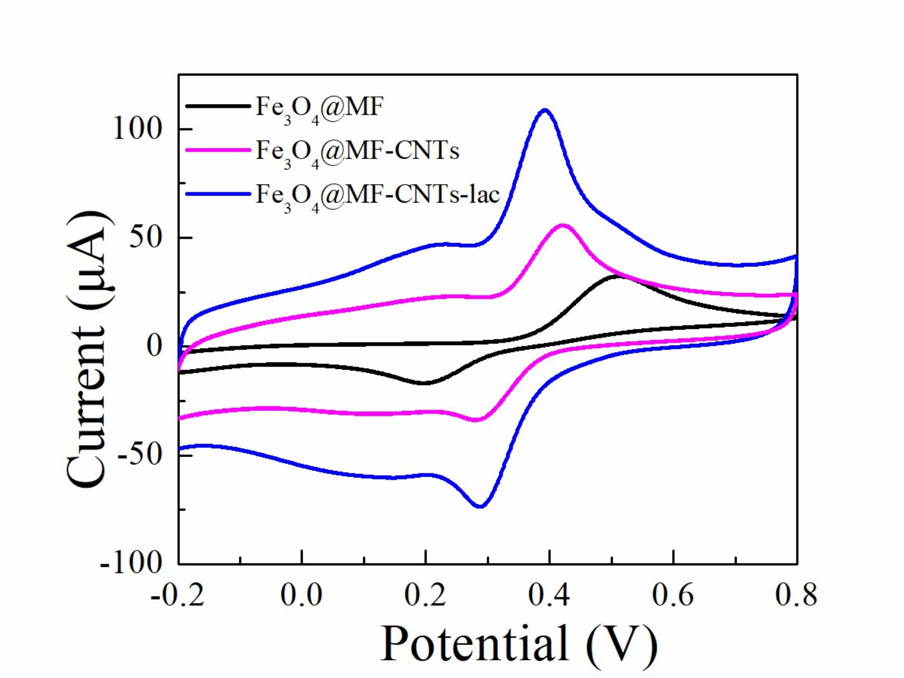

Fig. S5. CV curves of 800 μM catechol at Fe_3O_4@MF, Fe_3O_4@MF-CNT and Fe_3O_4@MF-CNTs-Lac electrodes in acetic acid buffer (pH = 4.5, 0.2 M).

Table S2 Performance comparison of different laccase based electrodes toward catechol.

Electrode	Detection limit	linear range	Sensitivity	reference
Lac/CNTs/CS/GC	0.66 μM	1.2-30 μM	n.d.	1
AuNP-MoS_2-Lac	2 μM	2-2000 μM	16.3 μA/mM	2
SiNPs/PBSeThTh/MWCNTs/lac	1.11 μM	10-400 μM	n.d.	3
GCE/Lac	n.d.	1.0-90.9 μM	0.0954 μA/μM	4
Lac-Au-ZnO	25 nM	75 nM-1100μM	131 μA/mM	5
WlacD-GC/lac	1.0 μM	0.5-300 μM	n.d.	6
Lac/Au-CTAB/GO	1.5 μM	0.1-5 and 16.7-166 μM	37 and 16 μA/mM	7
GE/BOTT/Lac	0.38 μM	0.5-25.0 μM	110.8 μA/mM	8
eLac-C-SPE	1.7 μM	2-100 μM	n.d.	9
FYSSns-2-Lac	1.6 μM	12.5-450 μM	n.d.	10
PDA-Lac-NiCNFs/MGCE	0.69 μM	1-9100 μM	25 μA/mM/cm	11
Lac-F,N-CDs	0.014 μM	12-450 μM	219.17 μA/mM/cm	12
CotA lac/Sg-CN/ITO	0.47 μM	1-900 μM	0.95 A/M/cm	13
TiO_2/NAF/Lac	0.75 μM	0.75-150μM	2.94 μA/μM	14

Au/PBA/Lac	0.06 μM	0.2-550 μM	n.d.	15
CotA/thGP/AuNPs/GE	0.3 μM	1.6-409.6 μM	0.11 μA/mM	16
Lac/MWCNT-COOH/AuNPs-SDBS-PEDOT	0.11 and 12.26 μM	0.1-0.5 and 11.99-94.11 μM	12.4 and 0.0955 μA/mM	17
BC/cMWCNTs/LAC@ZIF-90	1.86 μM	20-400 μM	22 μA/mM	18
GE/CDs/PFTBDT/Lac	1.23 μM	1.25-175 μM	737.44 μA/mM/cm	19
Ppy-TP/Lac	n.d.	1-60/70 μM	30-40 μA/mM/cm	20
Fe_3O_4@MF-CNTs-Lac	0.84 μM	1-3000 μM	4.51 μA/mM	This work

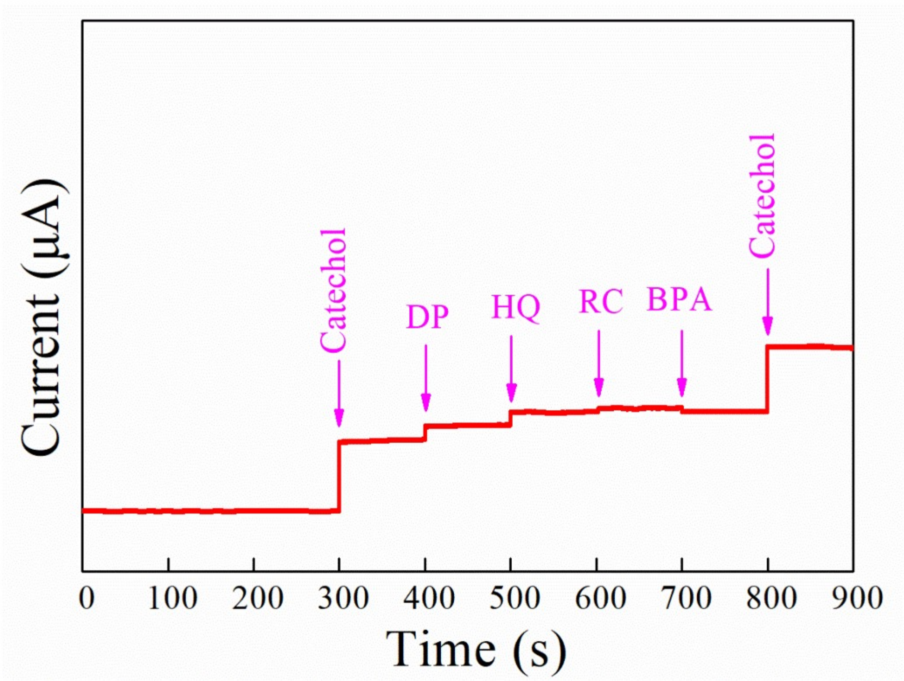

Fig. S6. Amperometric responses of the Fe_3O_4@MF-CNTs-Lac biosensor to successive injections of 10 μmol catechol dopamine (DP), hydroquinone (HQ), resorcinol (RC), bisphenol A (BPA) in 50 mL acetic acid buffer (pH 4.5).

References

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