Electronic Supplementary Material (ESI) for

A novel bromelain-MnO₂ nanozyme biosensor for the sensitive determination of dopamine

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Fig. S1. Optimization of Bro-MnO\textsubscript{2} synthesis conditions:

(A) the concentration of bromelain; (B) The effect of MnCl\textsubscript{2} concentration;

(C) the dosage of NaOH; (D) reaction time; (E) temperature.

Fig. S2. Dynamic light scattering measurements of Bro-MnO\textsubscript{2}.

Fig. S3. Absorbance of Bro-MnO\textsubscript{2} solution measured within 30 days.

Fig. S4. (A) The XPS test spectrum of Bro-MnO\textsubscript{2}: High resolution of Bro-MnO\textsubscript{2}; (B) Mn (2p); (C) Mn (3s).

Fig. S5. Optimization of experimental conditions for the determination of DA system:

(A)pH; (B) the choose of system buffer type; (C) the volume of NaAC-HAC.

Fig. S6. Optimization of DA system conditions:

(A) concentration of Bro-MnO\textsubscript{2}; (B) concentration of TMB substrate;

(C) temperature; (D) reaction time.

Fig. S7. The effect of ascorbic acid on the absorbance value in the system,

a:Bro-MnO\textsubscript{2}+TMB; b:Bro-MnO\textsubscript{2}+TMB+1mM AA;

c:Bro-MnO\textsubscript{2}+TMB+5mM AAQ-2+1mM AA;

d:Bro-MnO\textsubscript{2}+TMB+5mM AAQ-2+1\mu M DA

Table S1. Actual measurement and analysis of dopamine in biological samples.
Table S2. Comparison of dopamine assay results between this work with ELISA Kit (n=3).
Fig. 1. Optimization of Bro-MnO$_2$ synthesis conditions: (A) the concentration of bromelain; (B) the effect of MnCl$_2$ concentration; (C) the dosage of NaOH; (D) reaction time; (E) temperature.

Fig. 2. Dynamic light scattering measurements of Bro-MnO$_2$. Z-Average (d, nm) = 220.9.
Fig. 3. Absorbance of Bro-MnO$_2$ solution measured within 30 days.

Fig. 4. (A) The XPS test spectrum of Bro-MnO$_2$: High resolution of Bro-MnO$_2$; (B) Mn (2p); (C) Mn (3s).

Fig. 5. Optimization of experimental conditions for the determination of DA system:

- pH; (B) the choose of system buffer type; (C) the volume of NaAC-HAC
Fig. 6. Optimization of Bro-MnO$_2$-DA system conditions;

(A) concentration of Bro-MnO$_2$; (B) concentration of TMB substrate;

(C) temperature; (D) reaction time

Fig. 7. The effect of ascorbic acid on the absorbance value in the system,

a: Bro-MnO$_2$+TMB; b: Bro-MnO$_2$+TMB+1mM AA;

c: Bro-MnO$_2$+TMB+5mM AAQ-2+1mM AA;
d:Bro-MnO2+TMB+5mM AAQ-2+1μM DA
Table 1. Actual measurement and analysis of dopamine in biological samples

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<tr>
<th>Sample</th>
<th>Added (μM)</th>
<th>Found (μM)</th>
<th>Relative Recovery (%)</th>
<th>RSD (%)</th>
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Table 2. Comparison of dopamine assay results between this work with ELISA Kit (n=3)

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<th>RSD (%)</th>
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<td>98.9</td>
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$t(5, 95%)=2.571; \ t_{(this\ work)}=0.319$