Fluorescent multi-component polymer sensors for sensitive and selective detection of Hg$^{2+}$/Hg$^+$ ions via fluorescence and colorimetry dual mode

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Figure S1. $^1$H NMR spectra of small molecule compounds (a) O1, (b) BO1, (c) O2, and (d) BO2

Figure S2. (a) $^1$H NMR spectra of small molecule compounds PD (b) Mass spectra of PD
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Figure S14. (a) Concentration effect of MCP3 on Hg$^{+}$. (b) Concentration effect of MCP3 on Hg$^{2+}$.

(c) Concentration-dependent fluorescence signaling of a Hg$^{+}$ by MCP3, and (d) Hg$^{2+}$ by MCP3.
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Figure S16. (a) photograph of MCP4 with different concentrations of Hg$^+$ in water under natural light. (b) photograph of MCP4 with different concentrations of Hg$^{2+}$ in water under natural light.

Table S1. Comparison of the basic properties of the reported probe and the probe synthesized in
<table>
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<tr>
<th>Sensor</th>
<th>Selectivity</th>
<th>LOD</th>
<th>Analytical applications</th>
<th>Reference</th>
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<tr>
<td>1-CN</td>
<td>Good (Hg$^{2+}$)</td>
<td>0.8μM</td>
<td>Cell image</td>
<td>[1]</td>
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<tr>
<td>9AnPD</td>
<td>Effective (Hg$^{2+}$)</td>
<td>5μM</td>
<td>--</td>
<td>[2]</td>
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<td>BAN</td>
<td>Remarkable (Hg$^{2+}$)</td>
<td>0.00173 μM</td>
<td>Living HeLa cells</td>
<td>[3]</td>
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<tr>
<td>probe 1</td>
<td>Sensitive (Hg$^{2+}$)</td>
<td>0.2μM</td>
<td>Living cells</td>
<td>[4]</td>
</tr>
<tr>
<td>L</td>
<td>High (Hg$^{2+}$)</td>
<td>1.1μM</td>
<td>Living cell imaging</td>
<td>[5]</td>
</tr>
<tr>
<td>PTS</td>
<td>Sensitive (Hg$^{2+}$)</td>
<td>0.23μM</td>
<td>--</td>
<td>[6]</td>
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<tr>
<td>RFP3</td>
<td>Excellent (Hg$^{2+}$/Cu$^{2+}$)</td>
<td>0.012μM</td>
<td>HL-7702 cells</td>
<td>[7]</td>
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<tr>
<td>P-3</td>
<td>High (Hg$^{2+}$)</td>
<td>4.8μM</td>
<td>--</td>
<td>[8]</td>
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<td>MCP2</td>
<td>Sensitive (Hg$^{2+}$/Hg$^+$)</td>
<td>0.32/0.42μM</td>
<td>Lake water</td>
<td>This work</td>
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Figure S17. Benesi–Hilderbrand plot of (a) MCP1+Hg$^+$, (b) MCP1+Hg$^{2+}$, (c) MCP2+Hg$^+$, and (d) MCP2+Hg$^{2+}$

Figure S18. Benesi–Hilderbrand plot of (a) MCP3+Hg$^+$, (b) MCP3+Hg$^{2+}$, (c)
The fluorescence intensity of the polymer solution changes with the concentration of Hg$^{2+}$/Hg$^+$ (a) MCP1+Hg$^+$ (1 μM, pH = 7.0, rt); (b) MCP1+Hg$^{2+}$ (1 μM, pH = 7.0, rt); (c) MCP2+Hg$^+$ (1 μM, pH = 7.0, rt); (d) MCP2+Hg$^{2+}$ (1 μM, pH = 7.0, rt)
Figure S20. Absorbance of probes (10 μM) with other metal ions (100 μM) and albumin (3.6 mg/mL) in aqueous solution. The black bars represent the addition of different ions to the solution of correspond sensor. The red bars represent the subsequent addition of Hg²⁺/Hg⁺ to the solution.
Figure S21. The fluorescence emission spectrum of sensor in EtOH/H$_2$O and EtOH/natural lake water. (a) MCP1, (b) MCP2. UV absorption spectra of sensor in water and natural lake water. (c) MCP3, (d) MCP4

Figure S22. (a) $^1$H NMR of MCP1 in DMSO-d$_6$, (b) $^1$H NMR of MCP1 and equimolar amount of Hg$^+$ in DMSO-d$_6$. (c) $^1$H NMR of MCP1 and equimolar amount of Hg$^{2+}$ in DMSO-d$_6$. 
References


