

# Supporting Information

## Mixing-to-Answer Iodide Sensing with Commercial Chemicals

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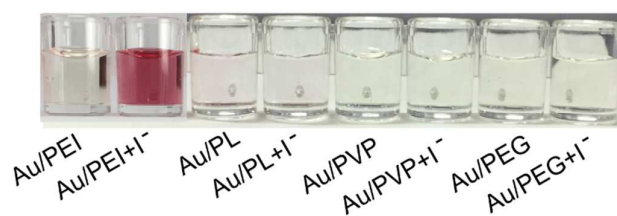
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HAuCl <sub>4</sub>	+	+	+	+	+	+
PEI			+	+	+	+
Incubation					+	+
I <sup>-</sup>		+		+		+

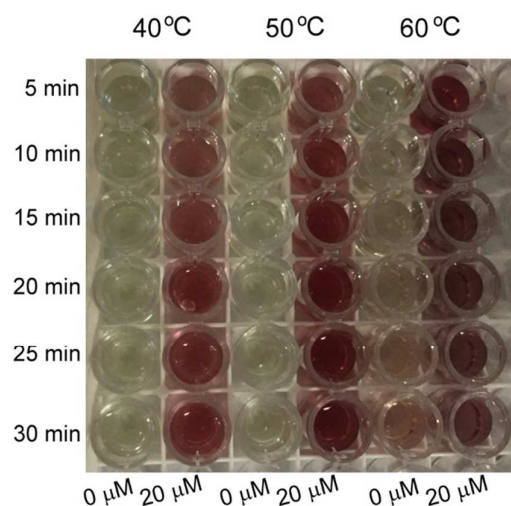
**Figure S1** Color changes of HAuCl<sub>4</sub>, the mixture of HAuCl<sub>4</sub> and PEI, and Au/PEI in the absence and presence of iodide.



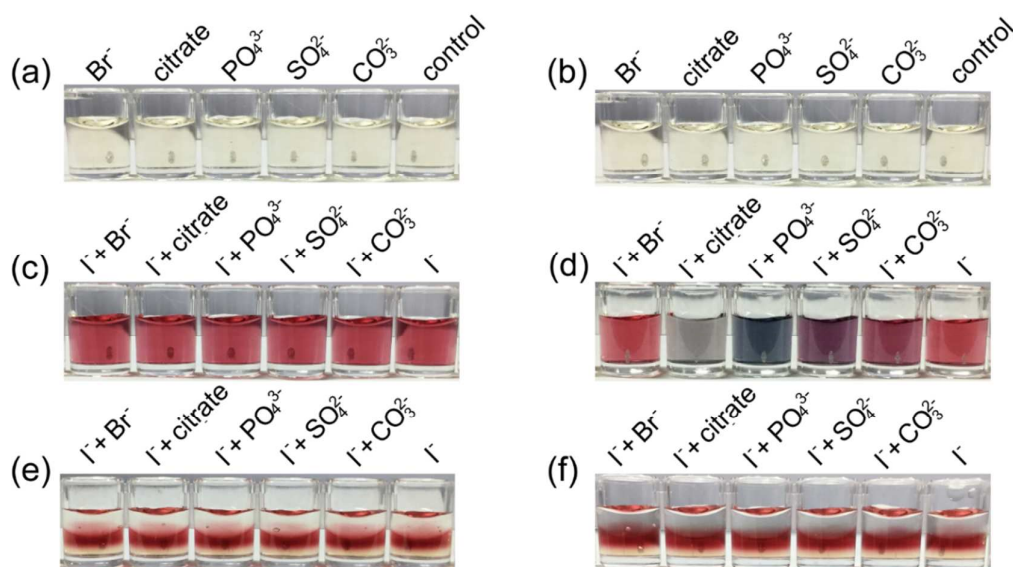
**Figure S2** Color changes of Au/PEI, Au/PL, Au/PVP and Au/PEG in the absence and presence of iodide (20  $\mu$ M). Au/PL, Au/PVP and Au/PEG are fabricated following the same protocol as Au/PEI's by incubating HAuCl<sub>4</sub> with poly-lysine (PL), polyvinyl pyrrolidone (PVP) and polyethylene glycol (PEG) at 60  $^{\circ}$ C for 5 min.



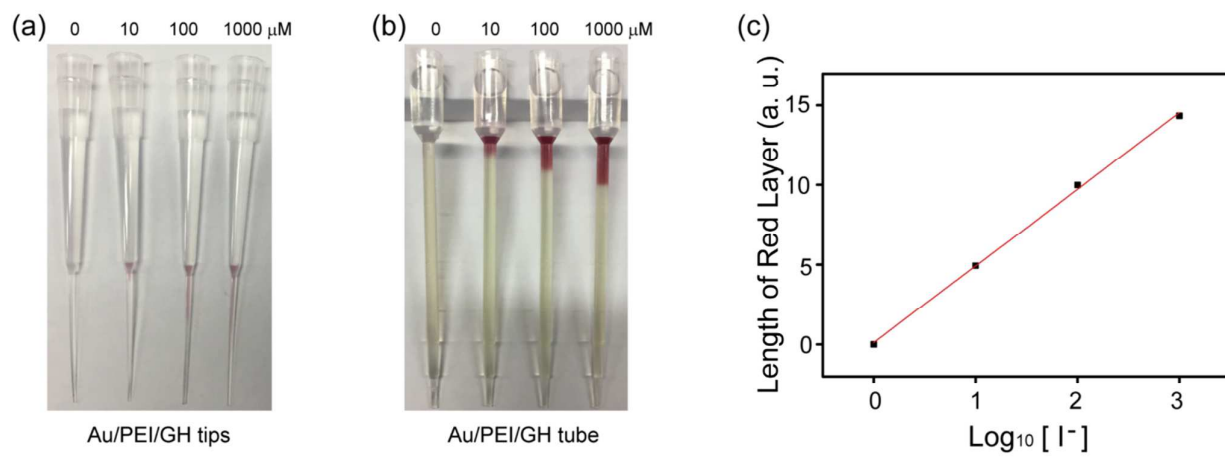
**Figure S3** Color changes of Au/PEI with different ratio of PEI and HAuCl<sub>4</sub> including 2.5 (Au/PEI<sub>2.5</sub>), 5 (Au/PEI<sub>5</sub>), 10 (Au/PEI<sub>10</sub>) and 20 (Au/PEI<sub>20</sub>) in the absence and presence of iodide (20  $\mu$ M).



**Figure S4** Color changes of Au/PEI prepared at different temperature for different length of time in response to iodide.



**Figure S5** Selectivity of Au/PEI and Au/PEI/GH. Au/PEI in the presence of (a) 100  $\mu\text{M}$  and (b) 500  $\mu\text{M}$  anions including  $\text{Br}^-$ , citrate,  $\text{PO}_4^{3-}$ ,  $\text{SO}_4^{2-}$  and  $\text{CO}_3^{2-}$ . Au/PEI in the presence of the mixture of  $\text{I}^-$  (20  $\mu\text{M}$ ) and (c) 100  $\mu\text{M}$  and (d) 500  $\mu\text{M}$  anions including  $\text{Br}^-$ , citrate,  $\text{PO}_4^{3-}$ ,  $\text{SO}_4^{2-}$  and  $\text{CO}_3^{2-}$ . Au/PEI/GH in the presence of the mixture of  $\text{I}^-$  (20  $\mu\text{M}$ ) and (e) 100  $\mu\text{M}$  and (f) 500  $\mu\text{M}$  anions including  $\text{Br}^-$ , citrate,  $\text{PO}_4^{3-}$ ,  $\text{SO}_4^{2-}$  and  $\text{CO}_3^{2-}$ .



**Figure S6** Length-based devices based on Au/PEI/GH. (a) Au/PEI/GH micro-pipette tips and (b) Au/PEI/GH tube for iodide sensing. (c) Linear relationship of the length of red layers of Au/PEI/GH tube to  $\text{Log}_{10}[\text{I}^-]$ .