

## *Supplementary Information*

### **Metal-deposited bismuth oxyiodide nanonetworks with tunable enzyme-like activity: sensing of mercury and lead ions**

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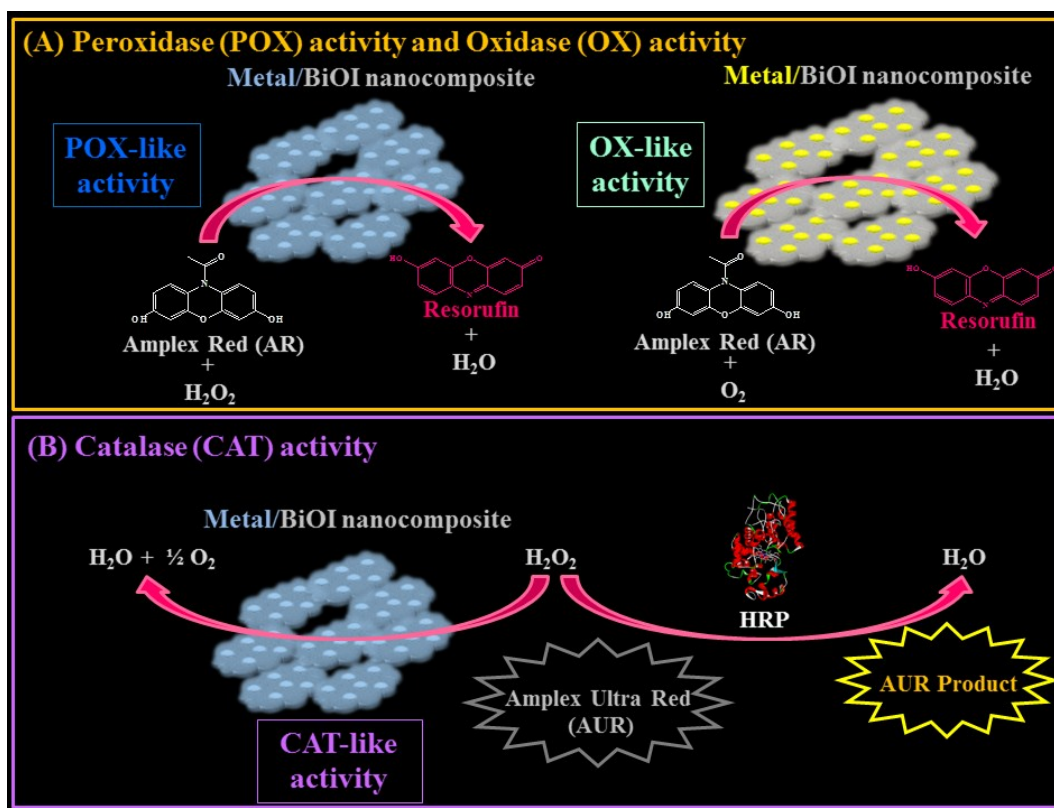
**Table S1.** Elemental ratio (Bi/X; X = Cl, Br or I) analysis of BiOX nanostructures by XPS, ICP-OES or ICP-MS.

<b>Nanostructures</b>	<b>XPS</b>	<b>Bi/X (ICP-OES or ICP-MS)</b>
<b>BiOCl</b>	7.2	4.9 <sup>a</sup>
<b>BiOBr</b>	7.0	5.5 <sup>b</sup>
<b>BiOI</b>	3.4	2.2 <sup>b</sup>

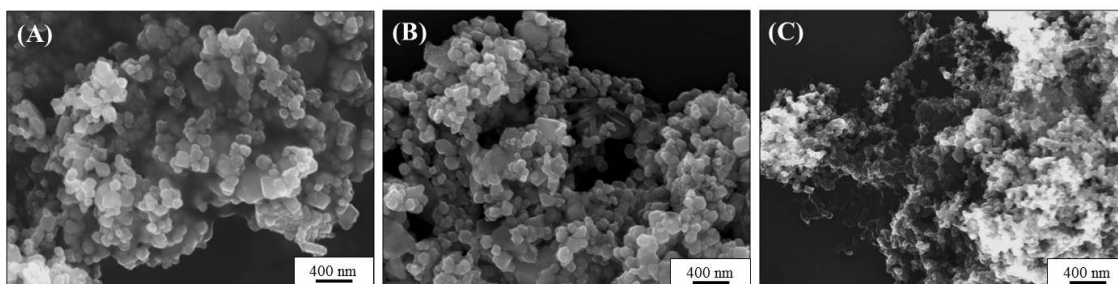
<sup>a</sup>Determined by ICP-OES. <sup>b</sup>Determined by ICP-MS.

**Table S2.** Analytical results for the detection of Hg<sup>2+</sup> and Pb<sup>2+</sup>-spiked water samples by O<sub>2</sub>/AR–Au NPs/BiOI nanocomposites and H<sub>2</sub>O<sub>2</sub>/AR–NiO NPs/BiOI nanocomposites sensing systems, respectively.

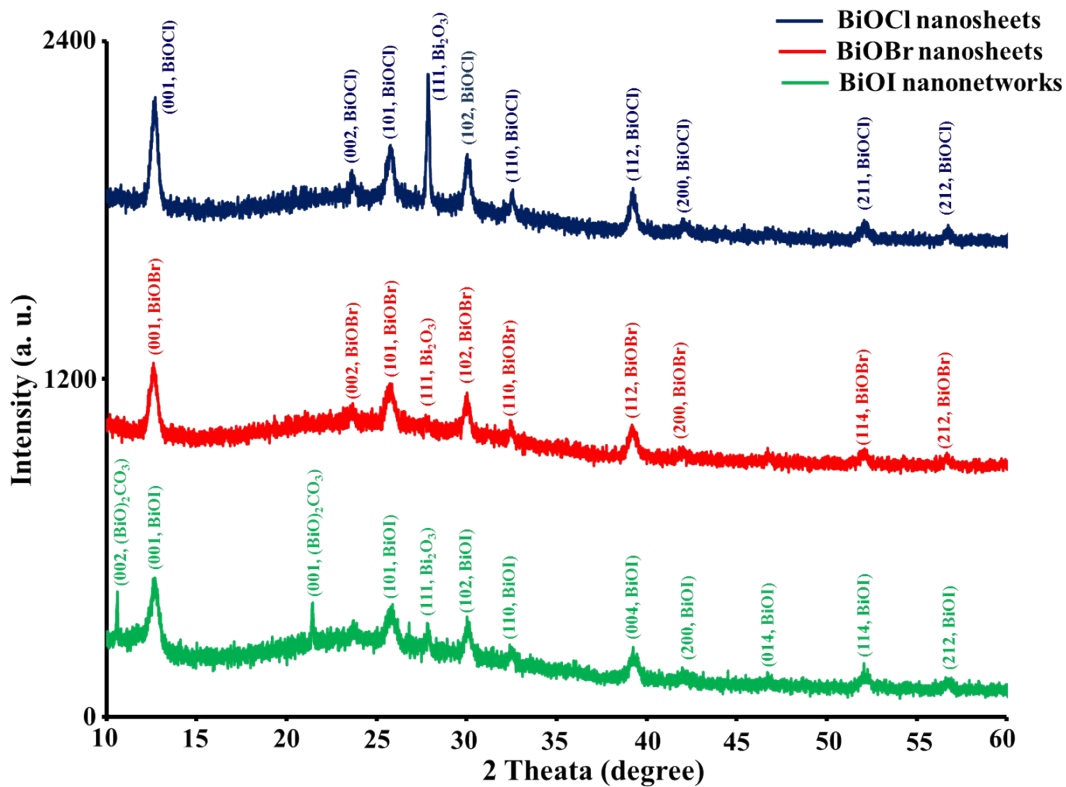
Probe	Real sample	Added Hg <sup>2+</sup> (nM)	Found Hg <sup>2+</sup> (nM)	Recovery	RSD (n = 3)	
<b>O<sub>2</sub>/AR–Au NPs/BiOI nanocomposites</b>	Tap water	20	20.7	104%	6.8%	
		100	99.9	99.9%	6.7%	
		500	539	108%	6.8%	
	River water	20	19.5	97.5%	5.9%	
		100	106	106%	5.2%	
		500	529	106%	5.3%	
	Lake water	20	20.4	102%	7.3%	
		100	104	104%	5.1%	
		500	559	112%	2.3%	
	Sea water	20	22.1	111%	8.0%	
		100	99.4	99.4%	6.9%	
		500	555	111%	4.0%	
	Probe	Real sample	Added Pb <sup>2+</sup> (nM)	Found Pb <sup>2+</sup> (nM)	Recovery	RSD (n = 3)
	<b>H<sub>2</sub>O<sub>2</sub>/AR–NiO NPs/BiOI nanocomposites</b>	Tap water	20	18.8	94.0%	7.8%
			100	96.3	96.3%	7.8%
500			545	109%	7.5%	
River water		20	21.5	108%	7.5%	
		100	106	106%	8.2%	
		500	533	107%	6.0%	
Lake water		20	19.4	97.0%	8.2%	
		100	112	112%	7.2%	
		500	548	110%	4.7%	
Sea water		20	20.9	105%	7.4%	
		100	107	107%	6.2%	
		500	556	111%	8.0%	



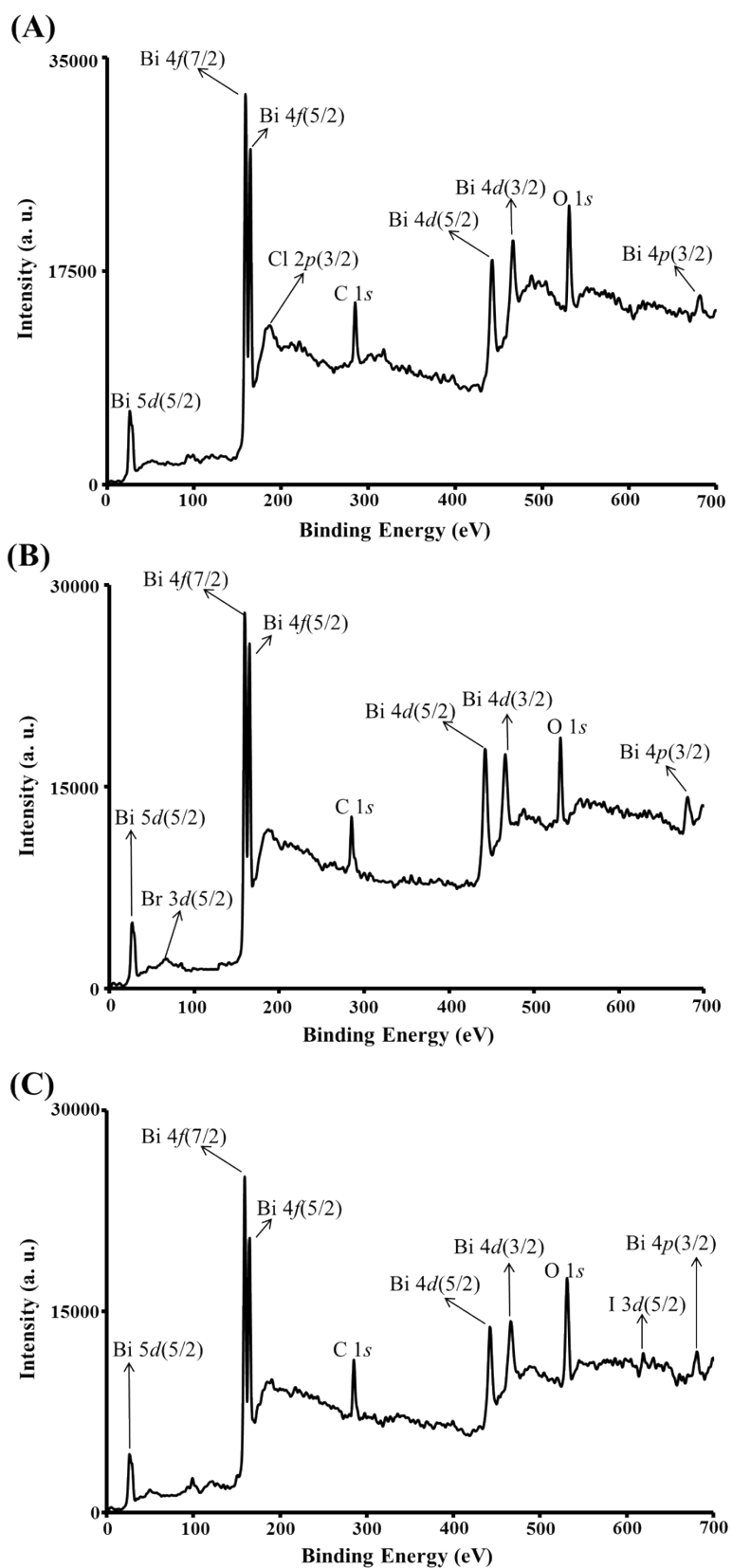
**Scheme S1.** Schematic representation of the evaluation of metal-deposited BiOI having (A) POX- and OX- and (B) CAT-like activities.



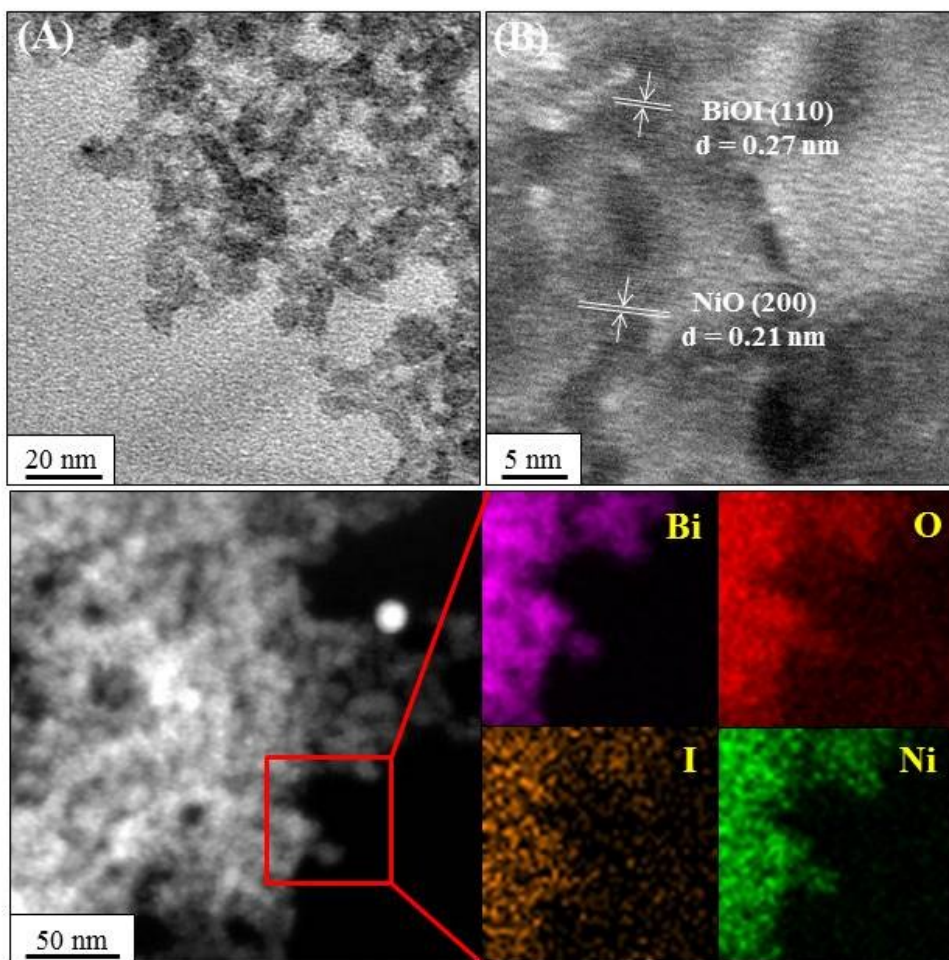
**Figure S1.** SEM images of as-prepared (A) BiOCl nanosheets, (B) BiOBr nanosheets, and (C) BiOI nanonetworks.



**Figure S2.** XRD patterns of as-prepared (A) BiOCl nanosheets, (B) BiOBr nanosheets, and (C) BiOI nanonetworks.

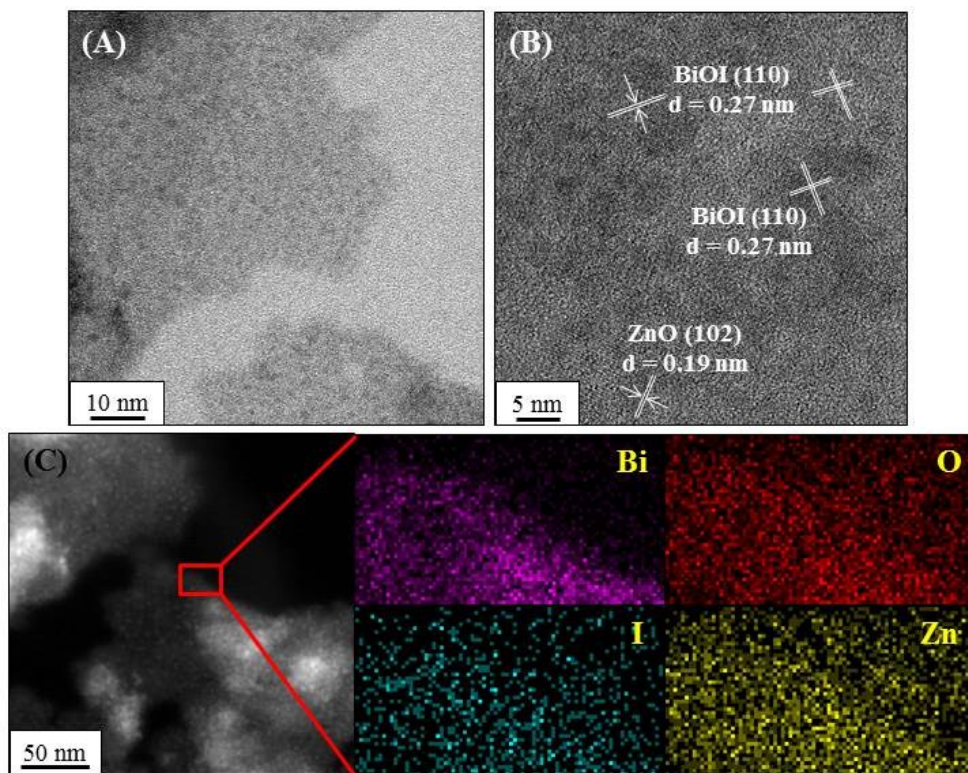


**Figure S3.** Survey scan XPS spectra of as-prepared (A) BiOCl nanosheets, (B) BiOBr nanosheets, and (C) BiOI nanonetworks.

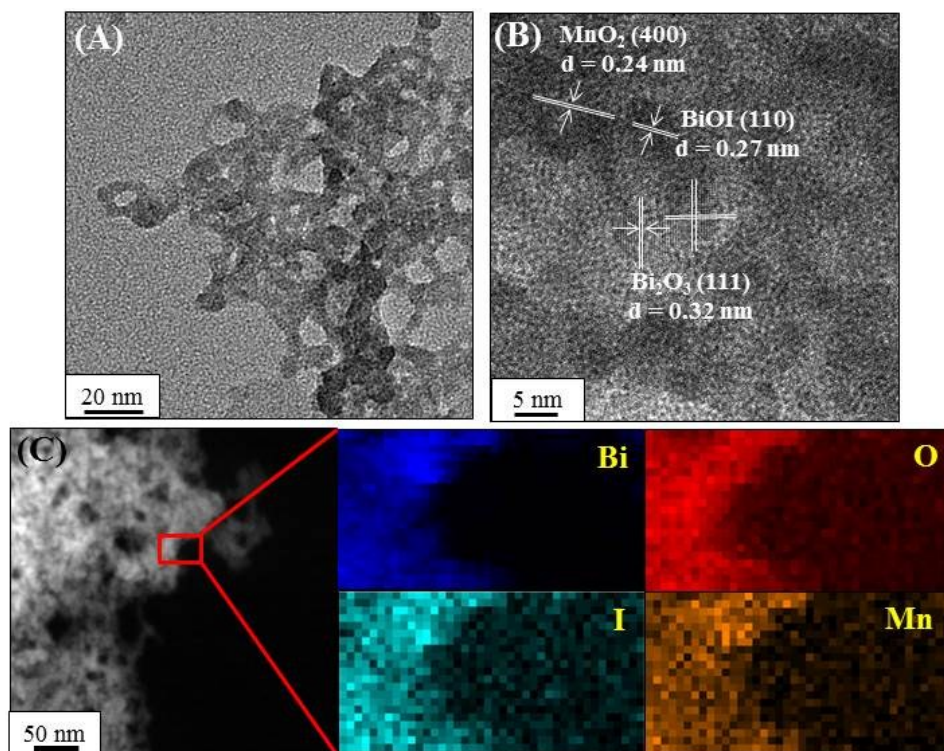


**Figure S4.** (A) TEM image, (B) HRTEM image, and (C) high-angle annular dark-field scanning TEM mapping images of NiO NPs/BiOI nanocomposites.





**Figure S5.** (A) TEM image, (B) HRTEM image, and (C) high-angle annular dark-field scanning TEM mapping images of ZnO NPs/BiOI nanocomposites.



**Figure S6.** (A) TEM image, (B) HRTEM image, and (C) high-angle annular dark-field scanning TEM mapping images of MnO<sub>2</sub> NPs/BiOI nanocomposites.