

## Supplementary Informaiton

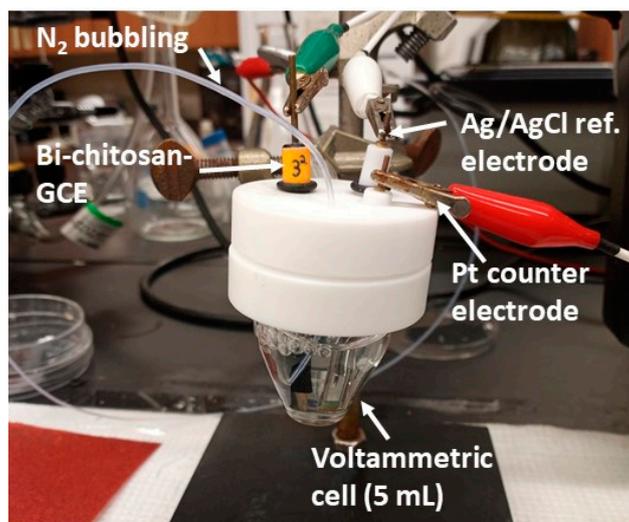
### Bismuth-chitosan nanocomposite sensors for trace level detection of Ni(II) and Co(II) in water samples

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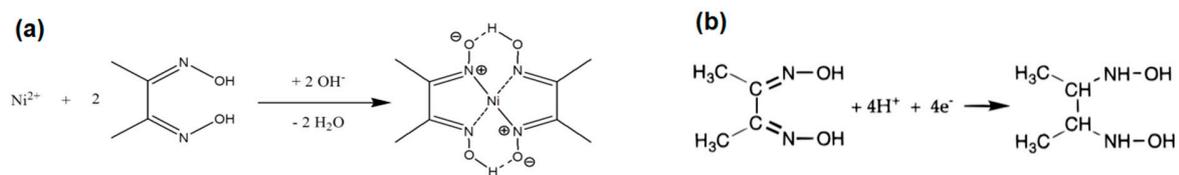
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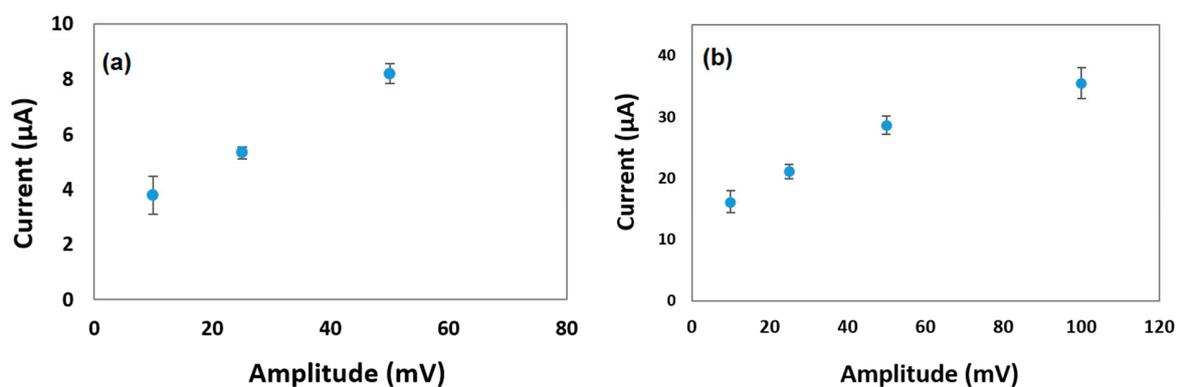
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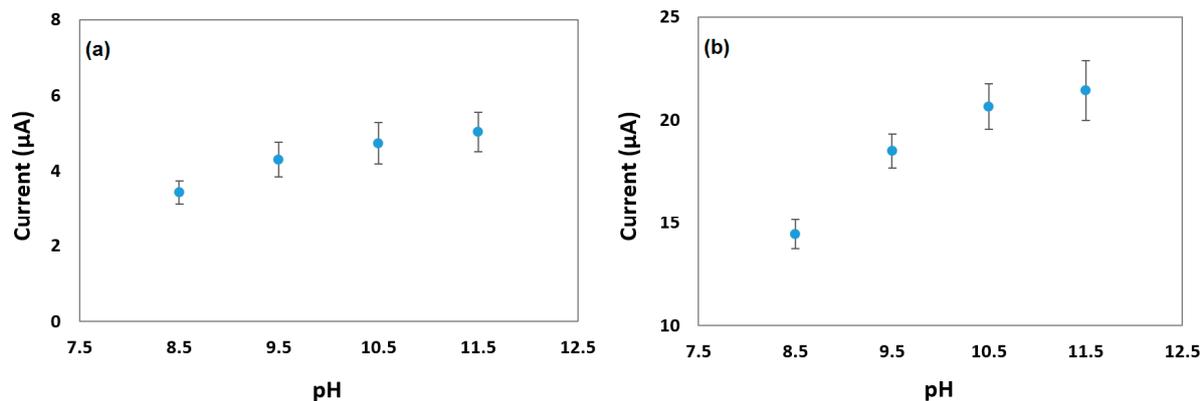
**Figure S1.** Experimental setup for electrochemical detection of Ni(II) and Co(II) using SWAdCSV technique.



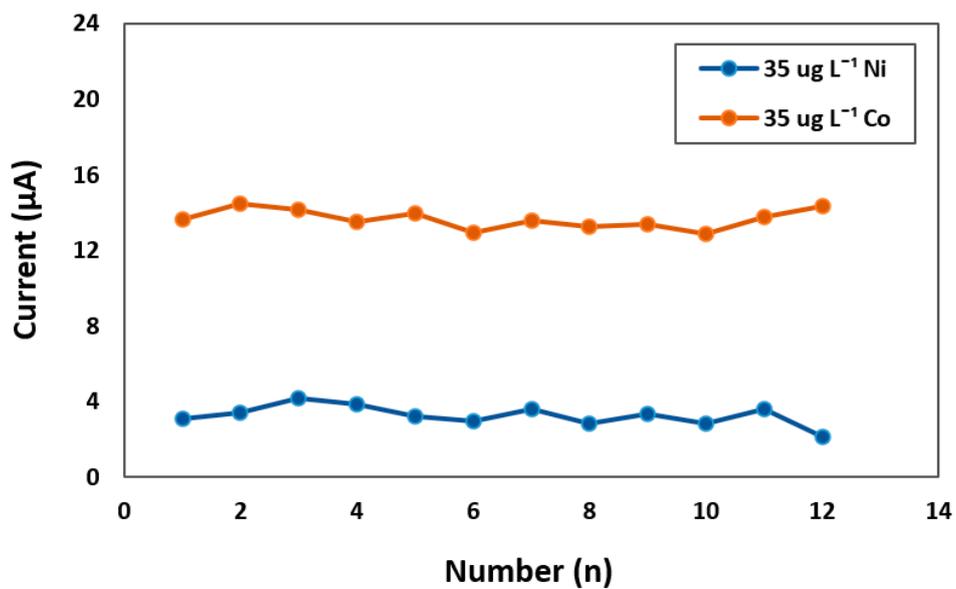
**Figure S2.** Schematic illustration of (a) metal-chelate complex formation, (b) reduction of glyoxime ligands [33,46].



**Figure S3.** Optimization of amplitude in the detection of: (a) Ni(II), (b) Co(II). SWAdCSV was performed in 0.1 M ammonia buffer solution at pH 9.2 containing 50 µg L<sup>-1</sup> of Ni(II) or Co(II).



**Figure S4.** Impact of electrolyte pH on the stripping peak currents of (a) Ni(II) and (b) Co(II). Ni(II) and Co(II) concentration was fixed at 35  $\mu\text{g L}^{-1}$ .



**Figure S5.** Reproducibility of the Bi-chitosan nanocomposite sensor for the detection of Ni(II) and Co(II) in the natural water samples.

**Table S1.** Optimal SWAdCSV operational conditions for Ni and Co measurements using Bi-chitosan coated sensor

Metal ion	Deposition potential (V)	Frequency (Hz)	Amplitude (mV)	DMG concentration (mM)	Deposition time (s)
Ni(II)	-0.9	120	50	0.2	120
Co(II)	-0.7	60			

**Table S2.** Optimum values for fitted equivalent circuit elements for Bi-chitosan-GCE EIS measurement data

Parameters	Upper limit	Lower limit	Results	Error (%)
R <sub>1</sub>	1000000	0	822.78	7.8918
R <sub>2</sub>	1000000	0	2.5428e05	1.6044
W <sub>1</sub>	10000000	0	0.14447	-
P <sub>1</sub>	0.0005	0	9.6454e-06	1.7855
n <sub>1</sub>	1	0	0.58657	0.74959

**Table S3.** Summary of sensor performance in ammonia buffer solution and natural water sample

Metal ion	Sample type	LOD ( $\mu\text{g L}^{-1}$ )	Sensitivity ( $\mu\text{A}/\mu\text{g L}^{-1}$ )	RSD * (%)	Linear range ( $\mu\text{g L}^{-1}$ )
Ni(II)	Ammonia buffer	3.67	0.119	3.2	Up to 100
	Natural water	5.02	0.098	7.7	Up to 50
Co(II)	Ammonia buffer	2.42	0.552	2.9	Up to 100
	Natural water	3.25	0.458	6.5	Up to 50

\* Relative standard deviation