Supplementary Information (SI) for Sensors & Diagnostics.

Optimizing the preparation of laser-derived 3D porous graphene electrodes for modification-free sensing of heavy metal ions

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Optimization of power

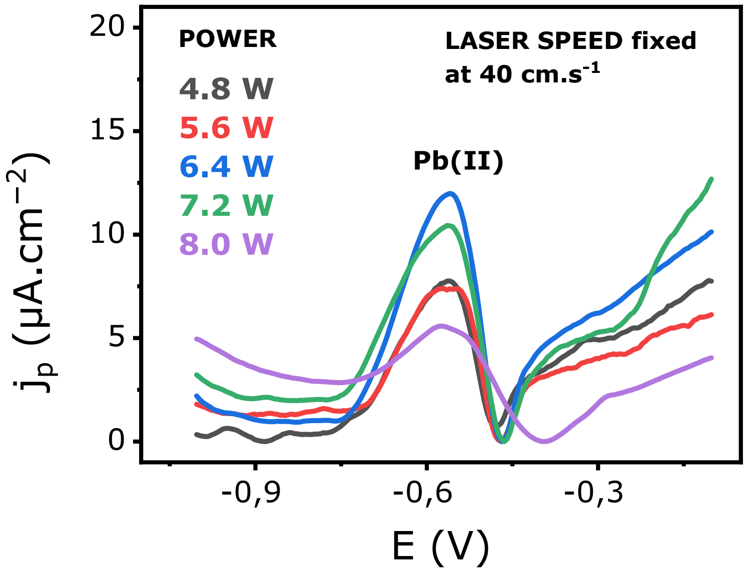

Figure S1: Voltammograms of SWASV responses of detection of 500 ppb of Pb for optimization of laser power. Parameters: E_{dep} = -1.3 V, T_{dep} = 180 s, F_{SW} = 5 Hz, and pH = 4.

Optimization of laser spot speed

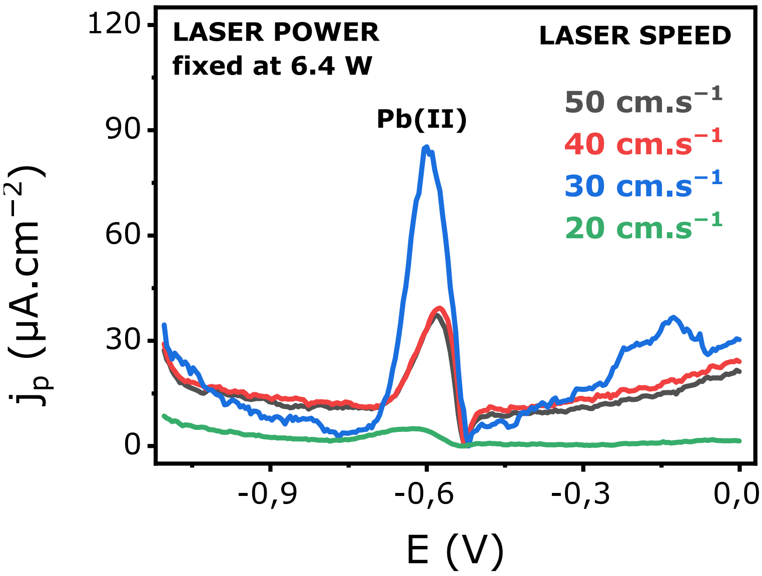

Figure S2: Voltammograms of SWASV responses of detection of 500 ppb of Pb^{2+} for optimization of laser beam speed. Parameters: E_{dep} = −1.3 V, T_{dep} = 180 s, F_{SW} = 1 Hz, and pH = 4.

Optimization of activation electrolyte of LIGE

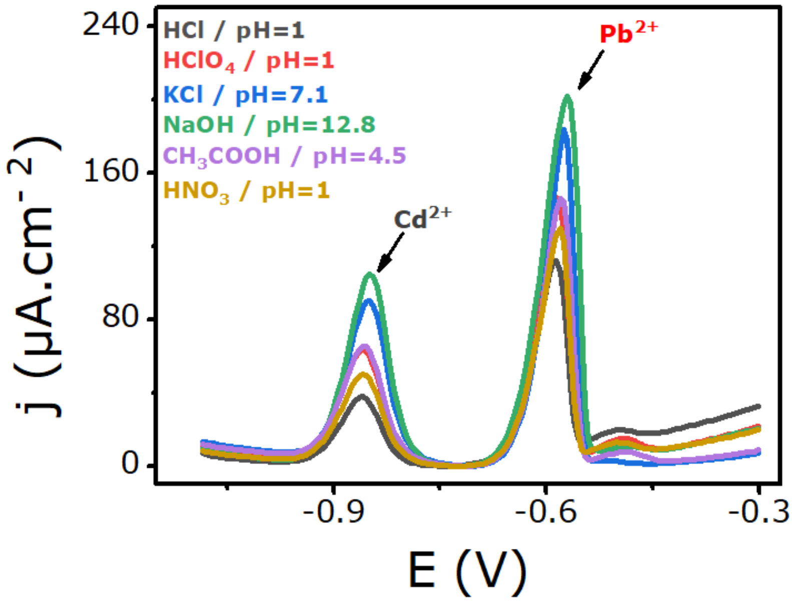

Figure S3: Voltammograms showing SWASV responses of 500 ppb of Cd^{2+} and Pb^{2+} of LIGE6.4W30 electrodes after activation in various electrolytes (see legend).

Measurement of the resistance of the LIGE6.4W30 electrode using a multimeter

Figure S4: Measurement of the resistance of the LIGE6.4W30 electrode using a multimeter.

EDX elemental analysis

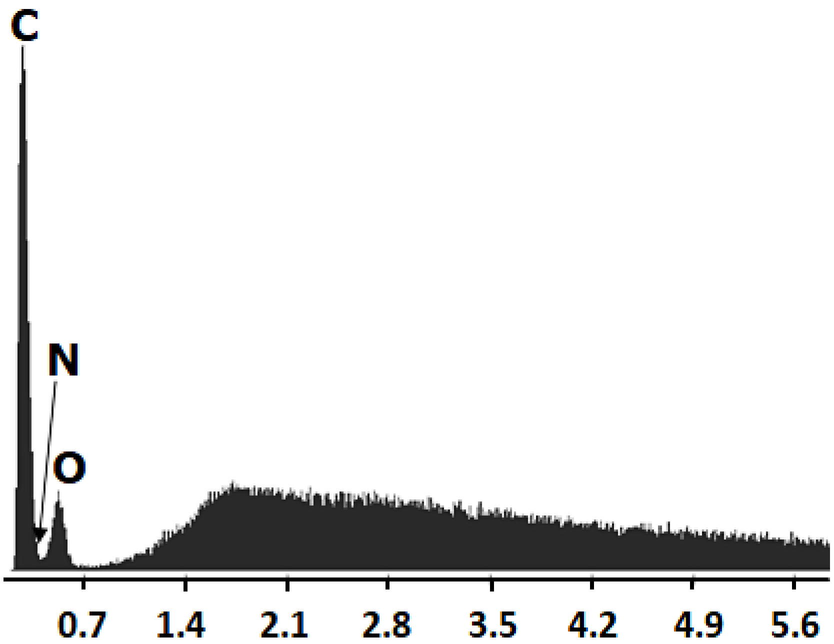

Figure S5: EDX elemental analysis

Optimization of detection parameters

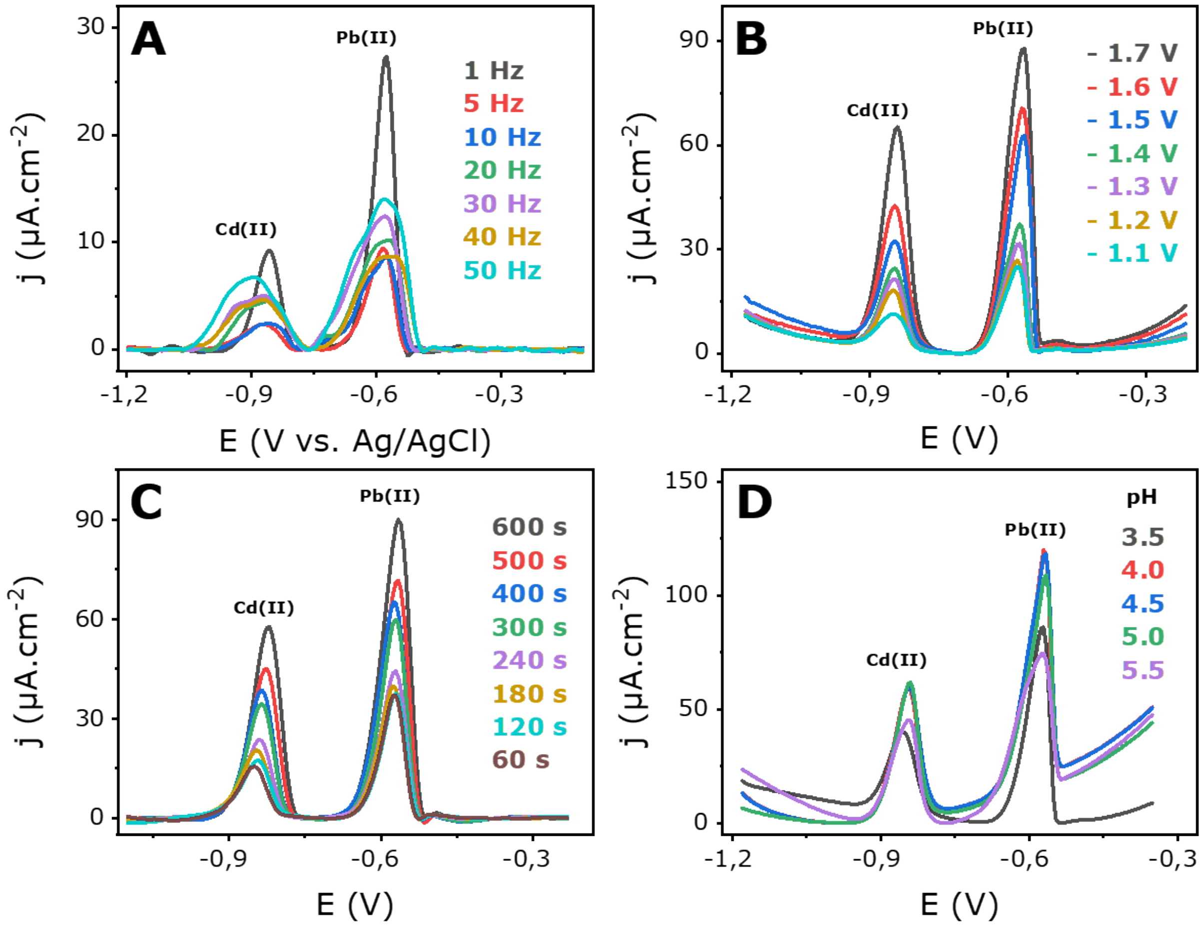

Figure S6: Voltammograms showing SWASV responses of 250 ppb of Cd^{2+} and Pb^{2+} during the optimization of square wave frequency (**A**), 500 ppb of Cd^{2+} and Pb^{2+} during deposition potential optimization (**B**), 250 ppb of Cd^{2+} and Pb^{2+} during deposition time optimization (**C**), and 250 ppb of Cd^{2+} and Pb^{2+} during optimization of the detection medium pH (**D**).

Interfering, detection in tap water, and reproducibility

Table S1: SWASV responses of 250 ppb of Cd^{2+} and Pb^{2+} sensing of LIGE6.4W30 in a 0.1 M acetate buffer solution at pH 4, in the absence and presence of various interfering species such as Zn^{2+}, Cu^{2+}, Cr(II), Co^{2+}, and Ba^{2+} at concentrations ranging from 2 to 6 times higher than the concentrations of Cd^{2+} and Pb^{2+}.

Interfering Metals ions	**C (ppb)**	**Peak intensity (μA)**		**(｜I_0-I｜/I_0)×100 (%)**	
		Cd^{2+}	Pb^{2+}	Cd^{2+}	Pb^{2+}
none	0	7.14	17.76		
Zn^{2+}, Cu^{2+}, Cr^{2+}, Co^{2+} and Ba^{2+}	250	7.15	17.75	0.14	0.05
	500	7.11	17.70	0.42	0.34
	1000	7.09	17.64	0.70	0.67
	1500	6.96	17.26	2.52	2.81