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Supporting Information

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Industrial Utilization of Capacitive Deionization Technology for the Removal of Fluoride and Toxic Metal Ions ($As^{3+/5+}$ and Pb^{2+})

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Supporting Information

Industrial Utilization of CDI Technology for Removal of Fluoride and Toxic Species ($As^{3+/5+}$ and Pb^{2+})

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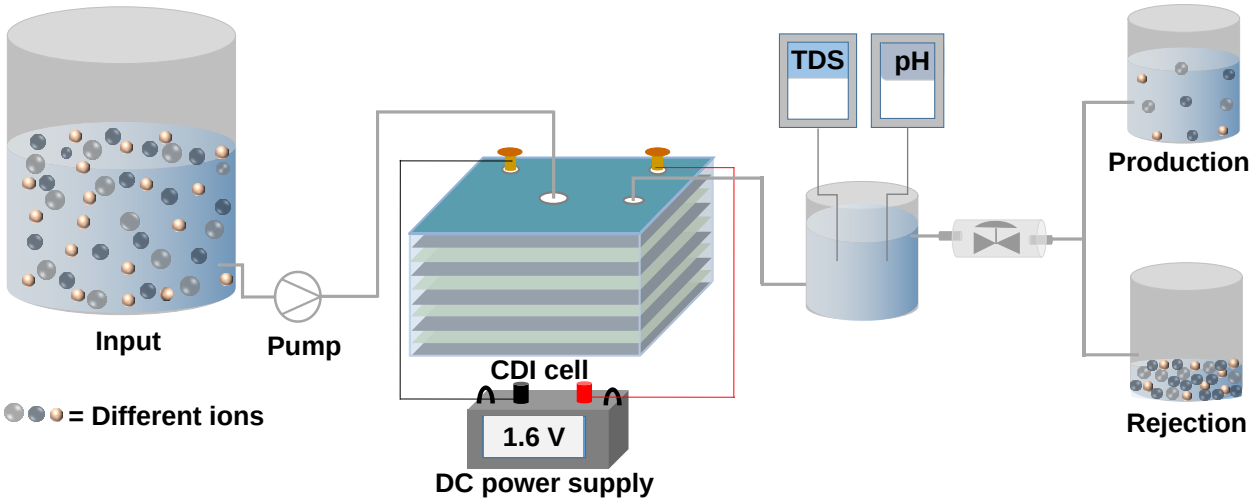

Figure S1. Schematic of CDI experimental set-up.

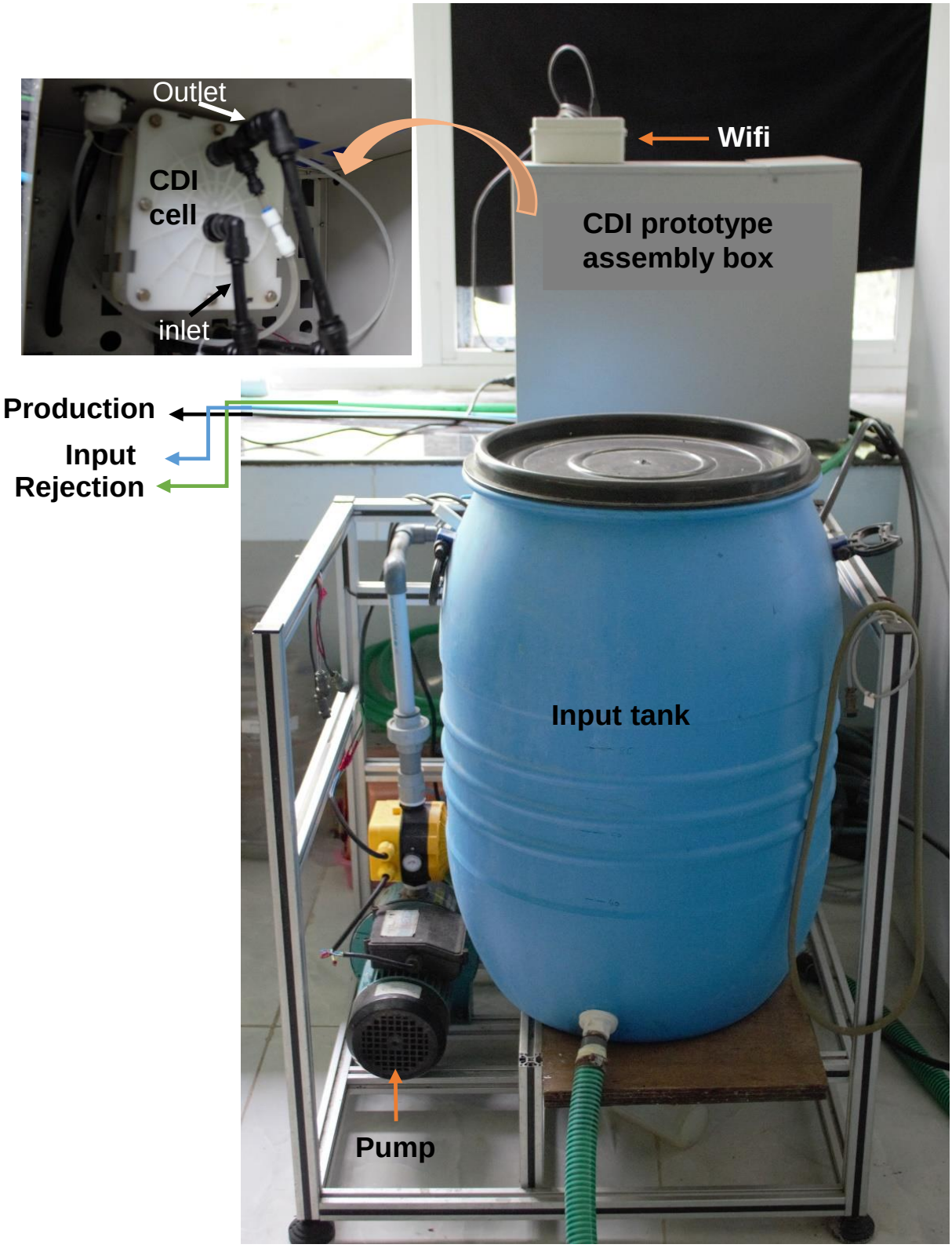

Figure S2. Photograph of the prototype of CDI experimental set-up. CDI box contains CDI cell and controlling electronic boards.

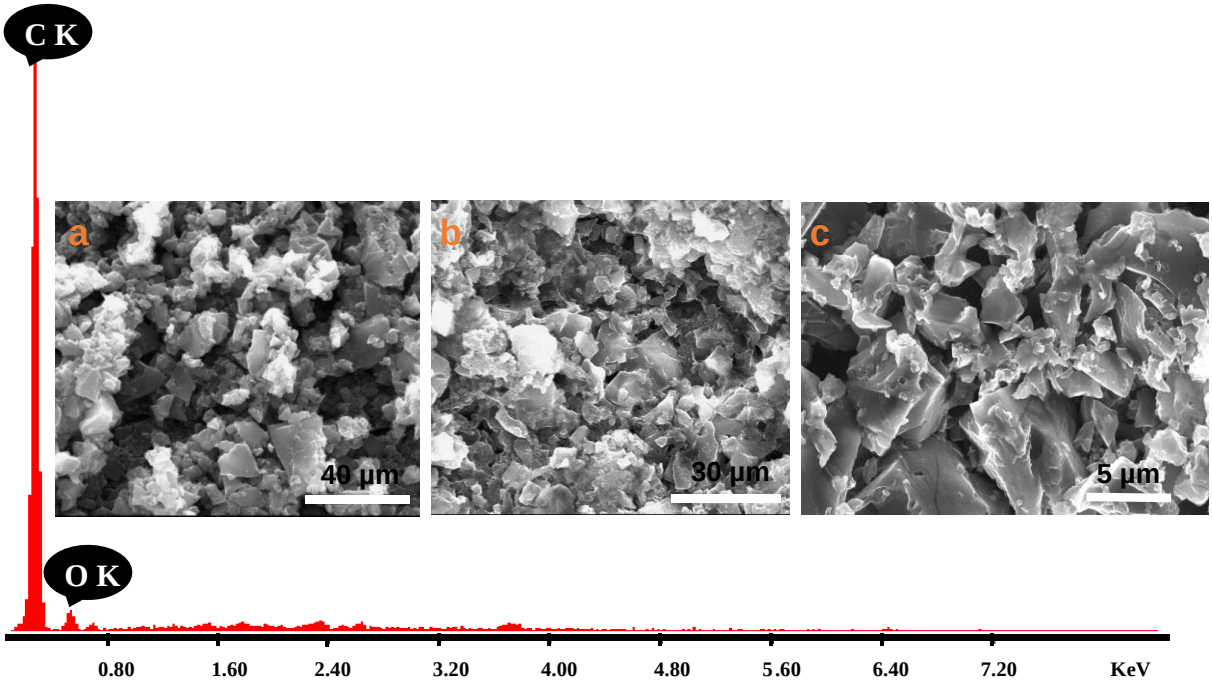

Figure S3. SEM EDS of carbon materials and SEM images are shown in the insets. (Scale bar is 40, 30, 5 µm for a, b, c, respectively)

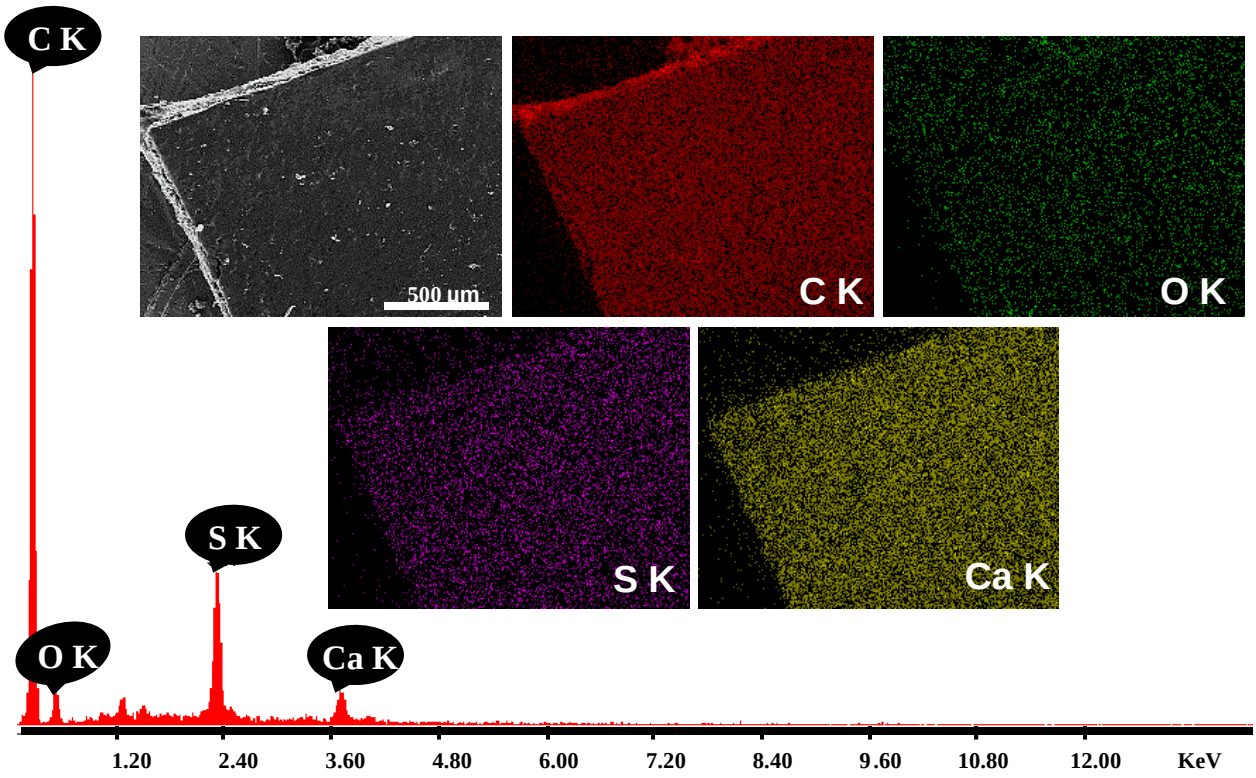

Figure S4. SEM EDS of the cation-exchange resin-coated electrode (cathode). The SEM image and the corresponding elemental mapping images are shown in the insets.

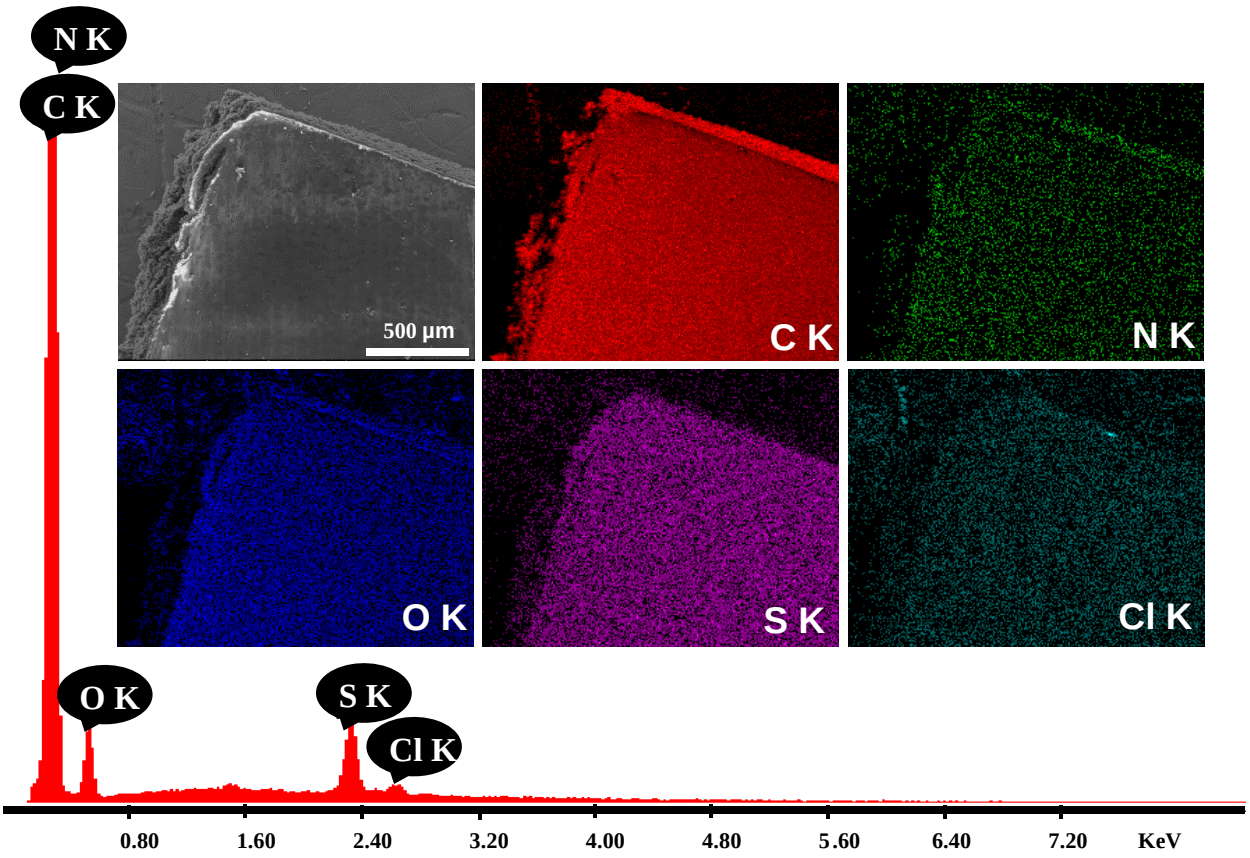

Figure S5. SEM EDS of the anion-exchange resin-coated electrode (anode). The SEM image and the corresponding elemental mapping images are shown in the insets.

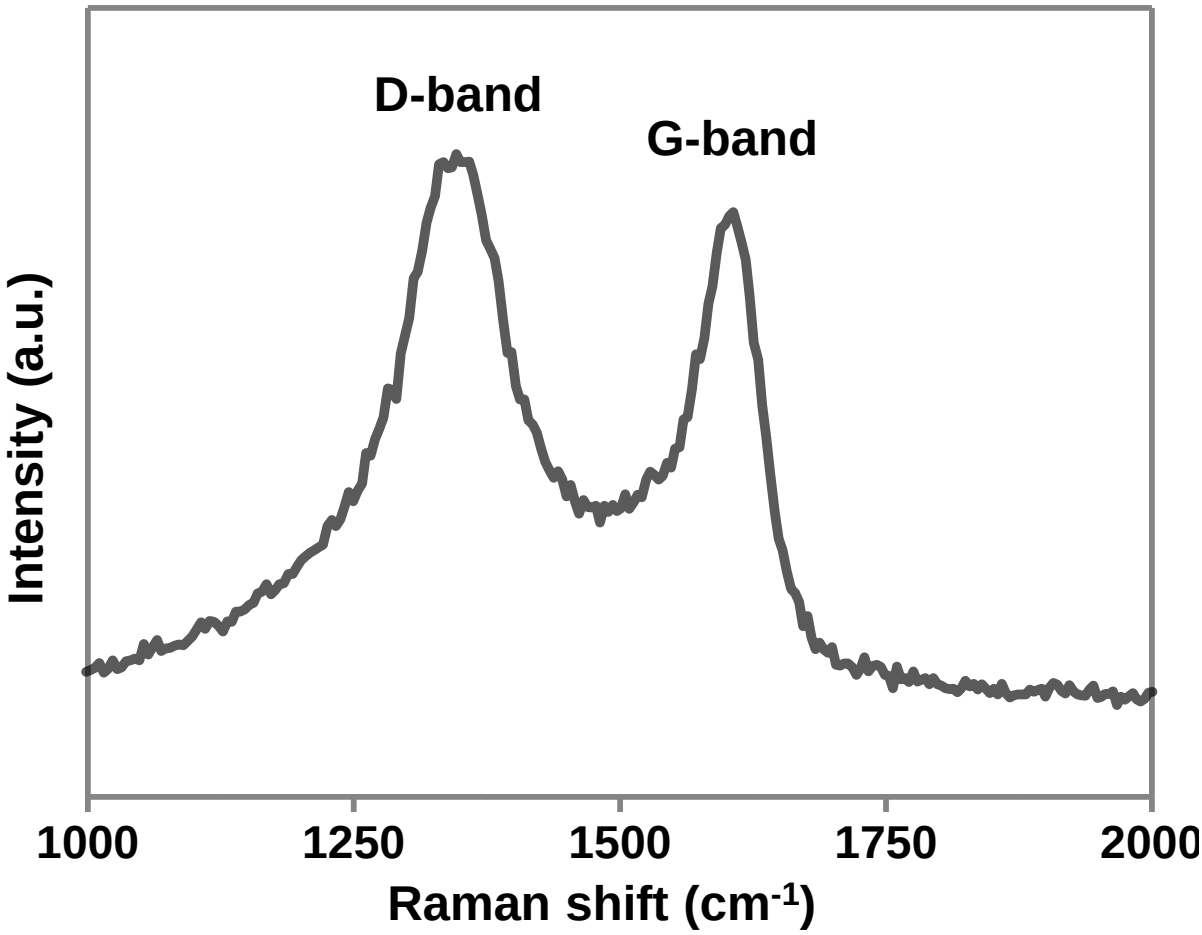

Figure S6. Raman spectrum of carbon materials.

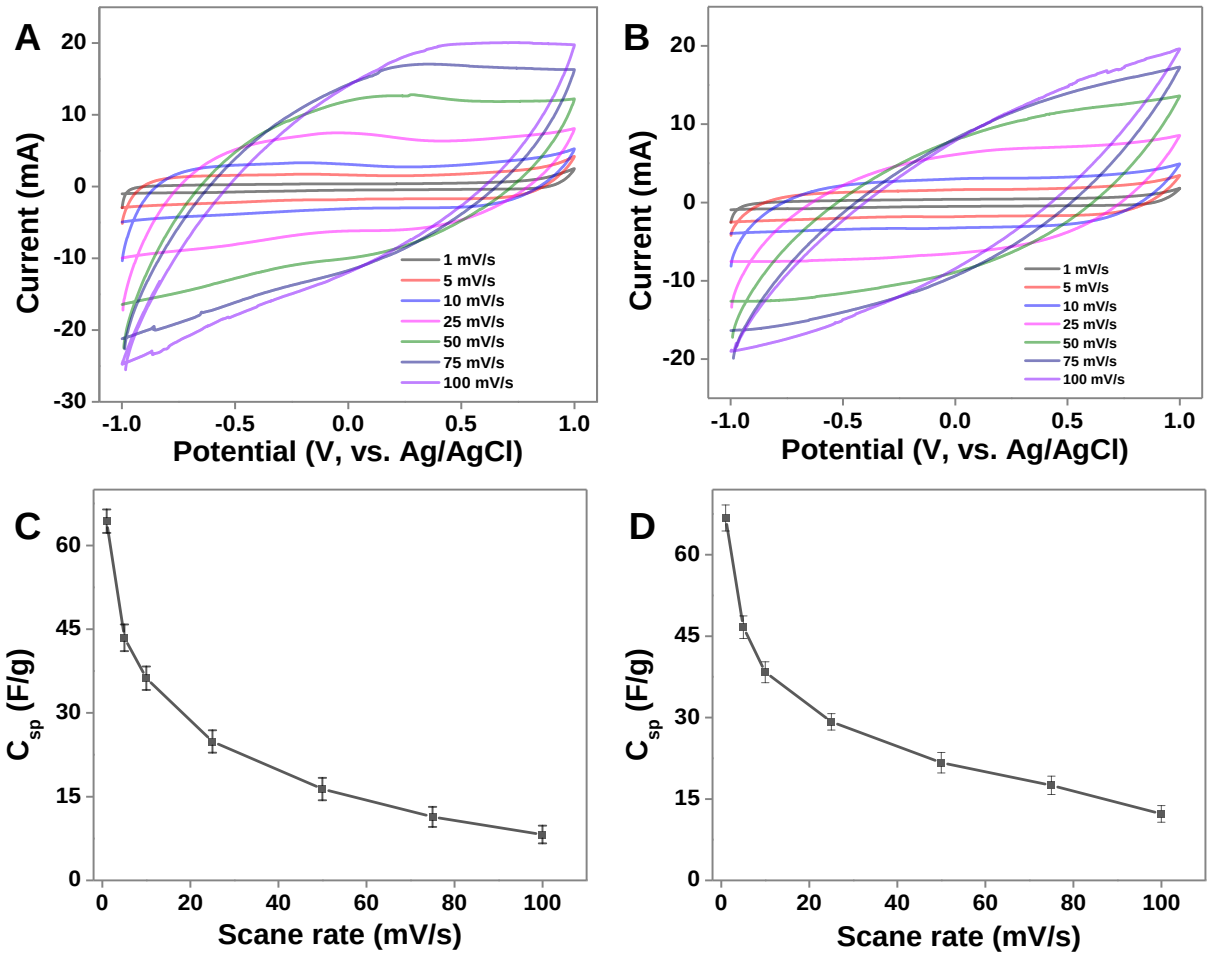

Figure S7. Cyclic voltammetry (CV) with varying scan rates A) cathode and B) anode; C) and D) are specific capacitance vs. scan rates for both cathode and anode materials, respectively. CV potential was varied with respect to Ag/AgCl electrodes using 1 M NaCl solution as an electrolyte.

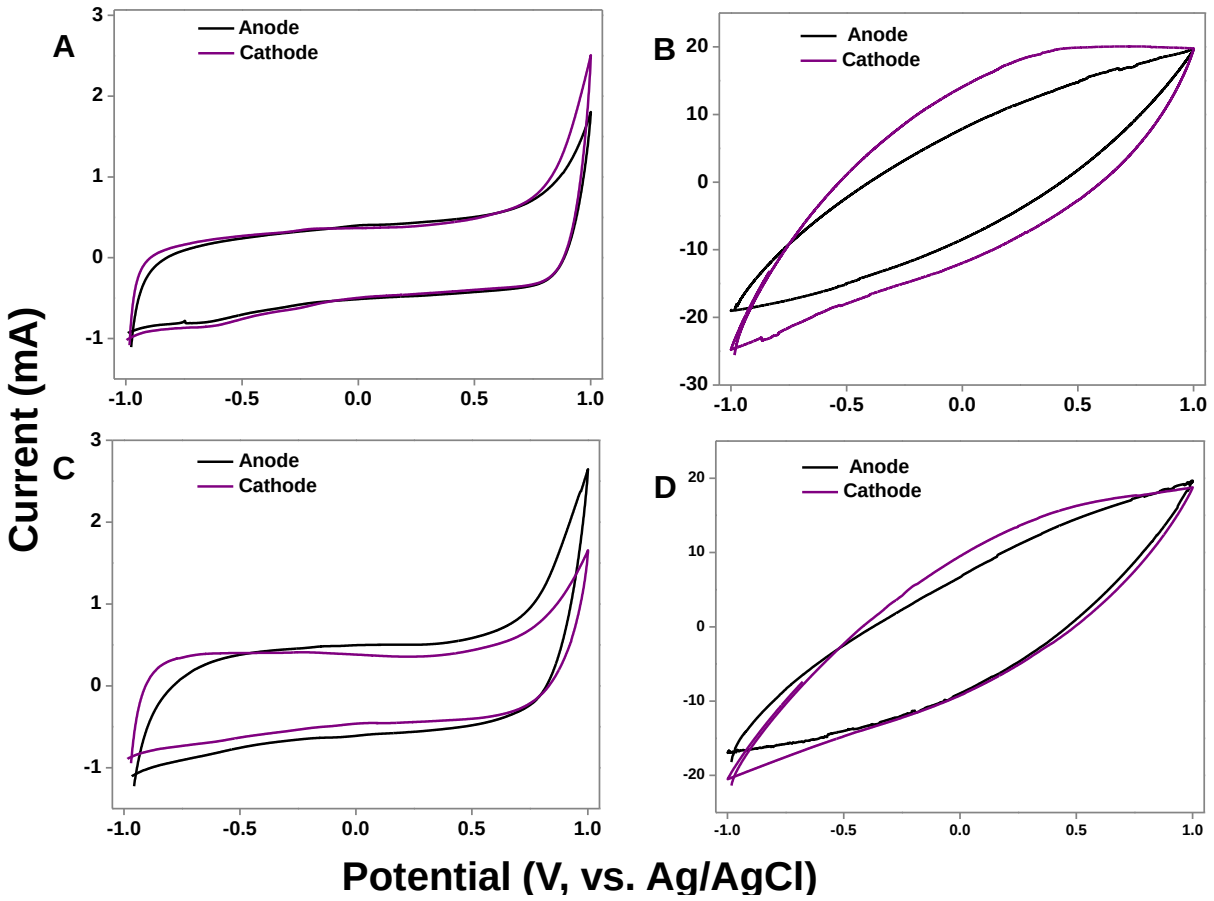

Figure S8. Cyclic voltammetry (CV) of A) cathode and anode both @1 mV/s in 1 M NaCl electrolyte, B) cathode and anode both @100 mV/s) in 1 M NaCl electrolyte, C) cathode and anode both @1 mV/s in 1 M NaF electrolyte and D) cathode and anode both @100 mV/s in 1 M NaF electrolyte.

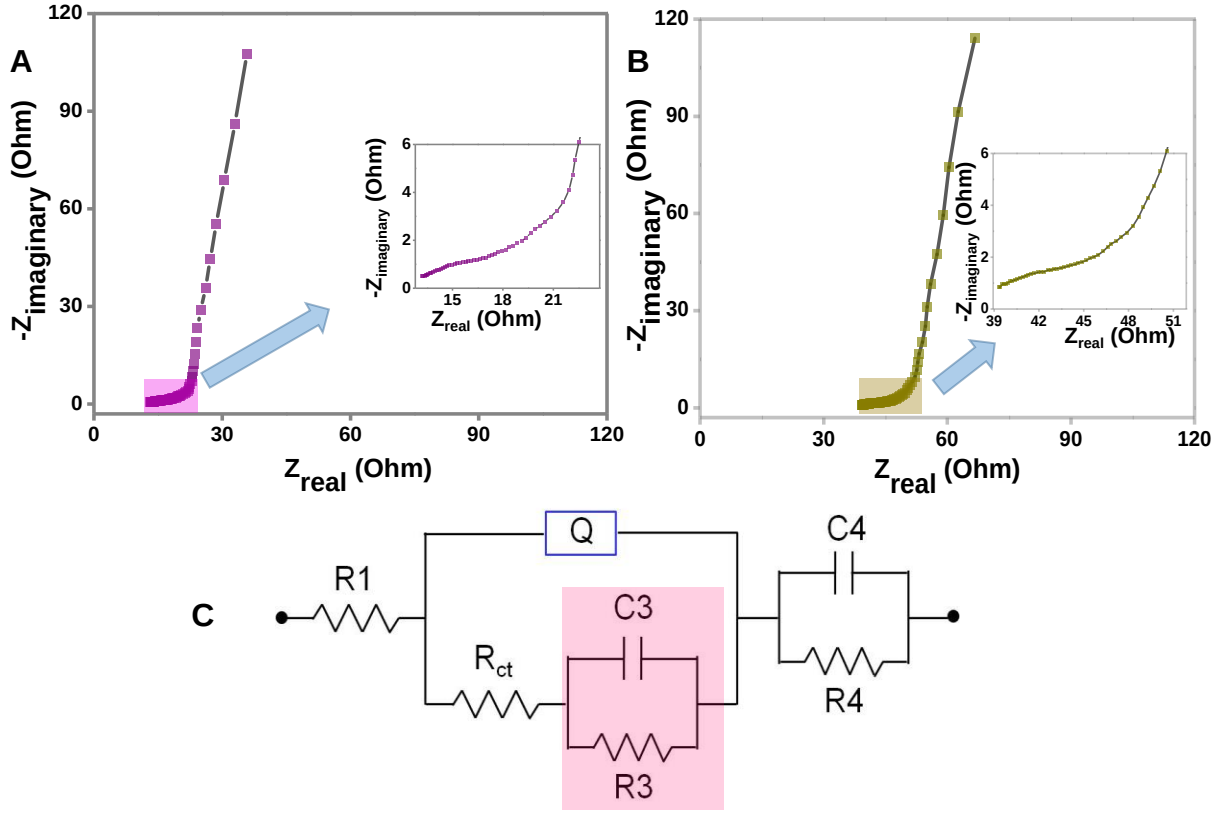

Figure S9. Nyquist Plot of A) cathode (the inset chart shows the magnified high-frequency region), B) anode (the inset chart shows the magnified high-frequency part), C) circuit for cathode and anode.

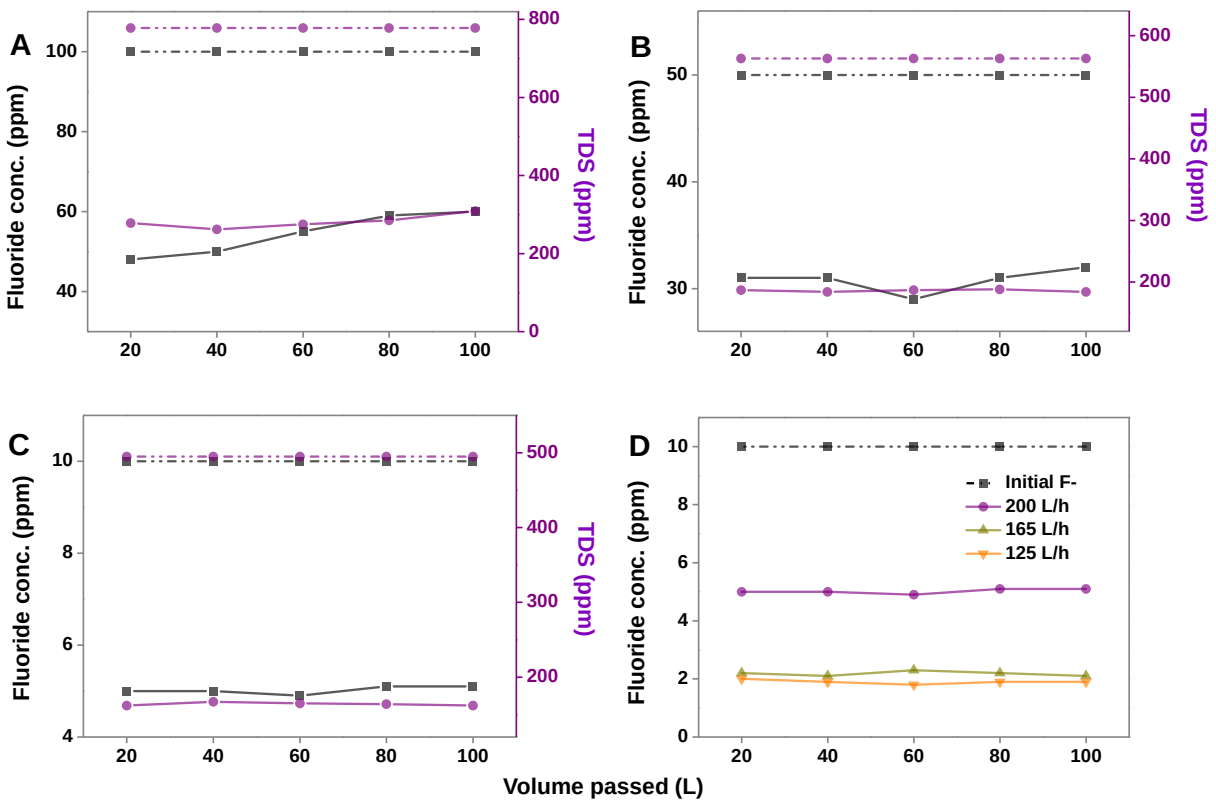

Figure S10. CDI performance for the removal of fluoride ion in tap water with initial concentration A) 100 ppm B) 50 ppm, C) 10 ppm with different TDS, and D) effect of flow rate with 10 ppm input fluoride concentration.

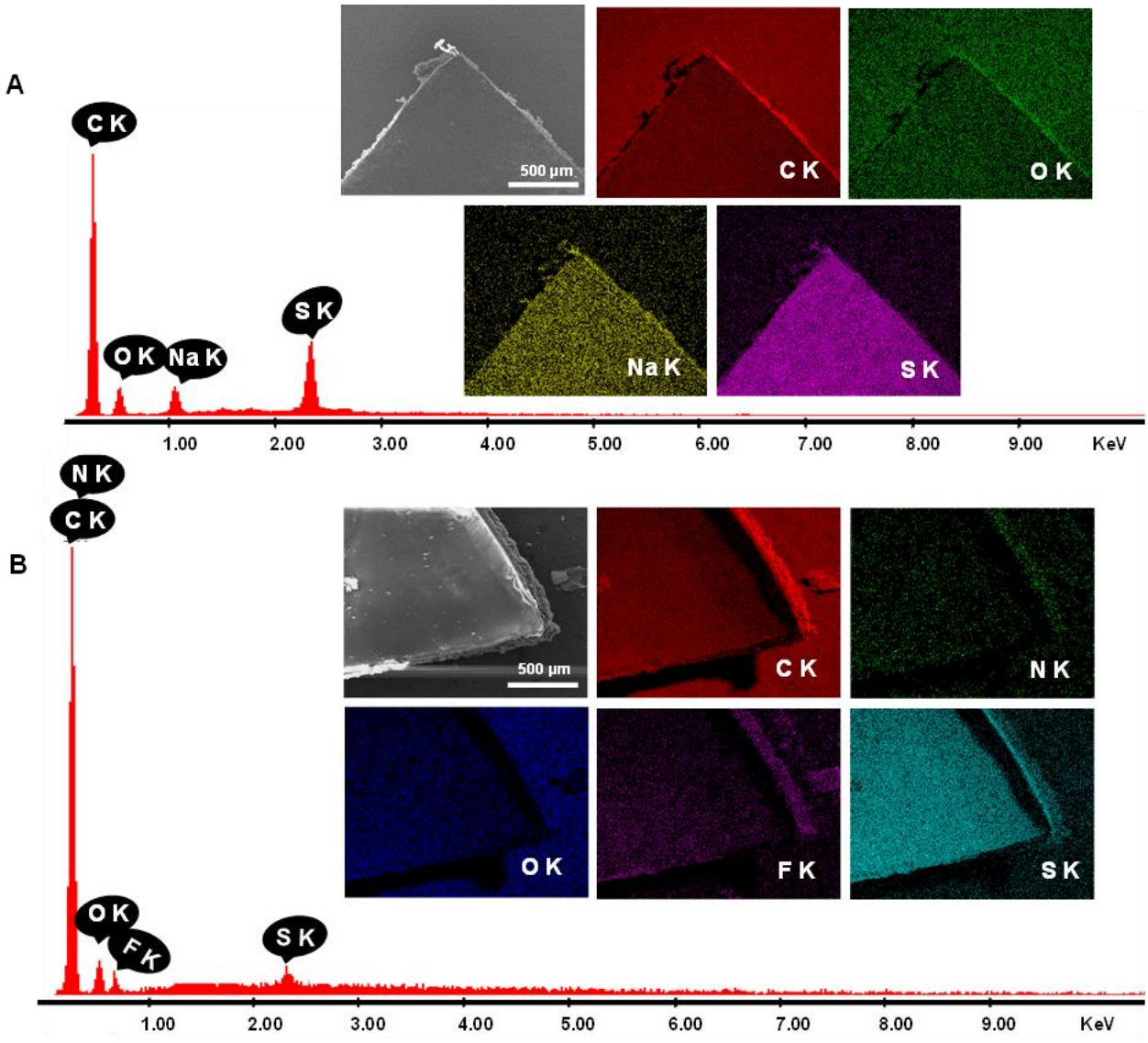

Figure S11. SEM EDS of NaF adsorption after single adsorption on A) cathode and B) anode. The corresponding SEM and elemental mapping images are shown in the inset.

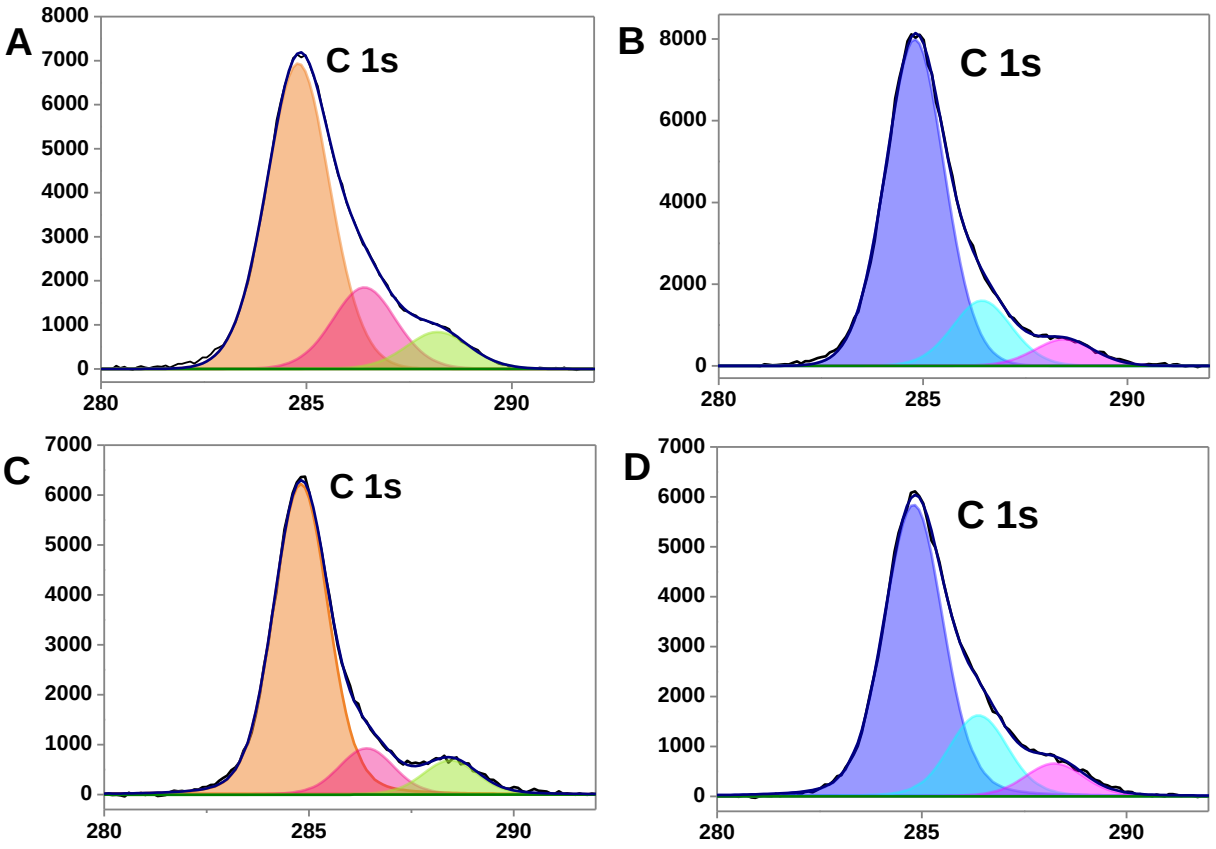

Figure S12. Deconvoluted XPS spectra of C 1s in A) cathode and B) anode before NaF adsorption; C) cathode and D) anode after NaF adsorption.

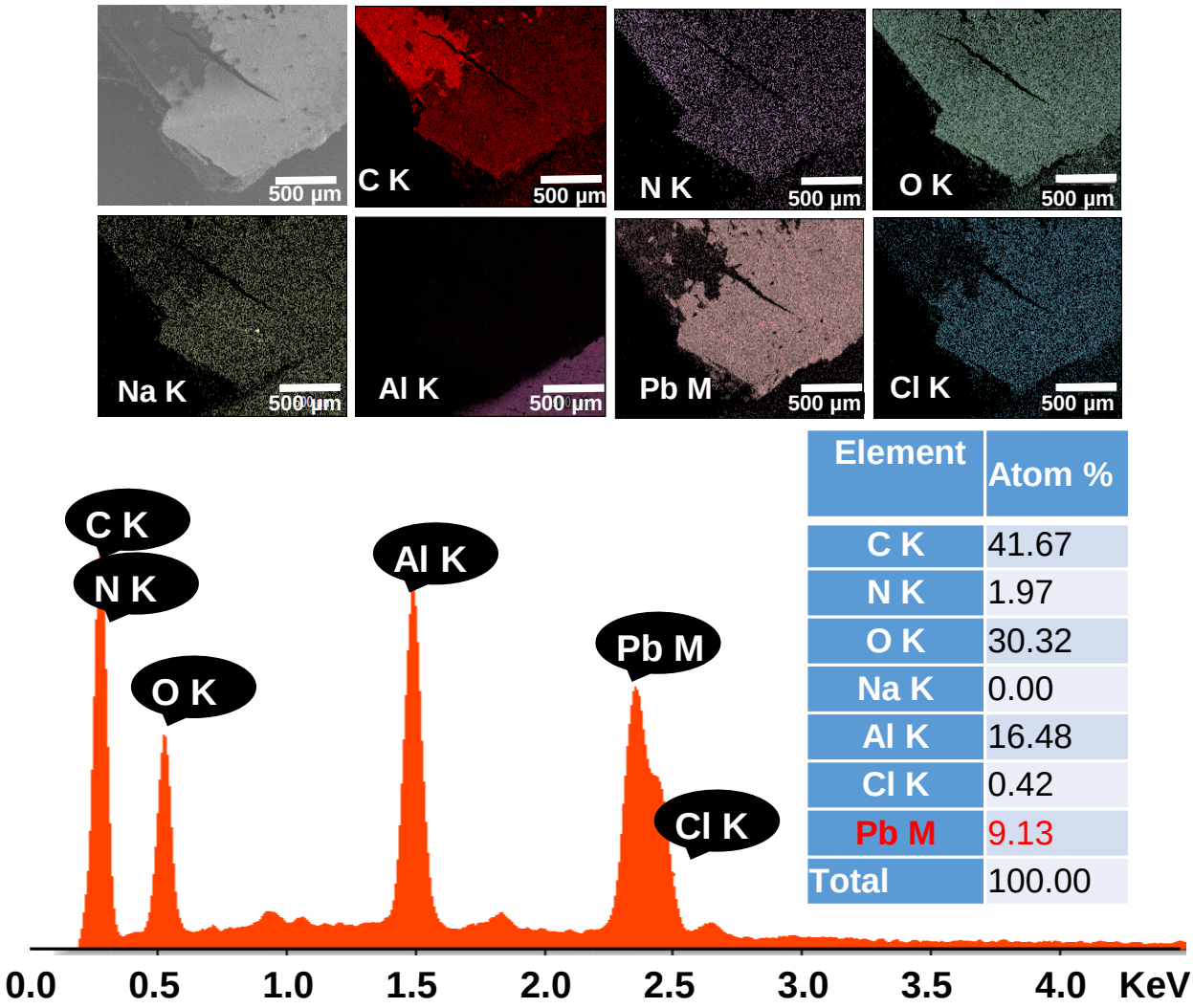

Figure S13. SEM EDS of $Pb(NO_3)_2$ adsorption after single adsorption on the cathode. The corresponding SEM and elemental mapping images are shown in the inset.

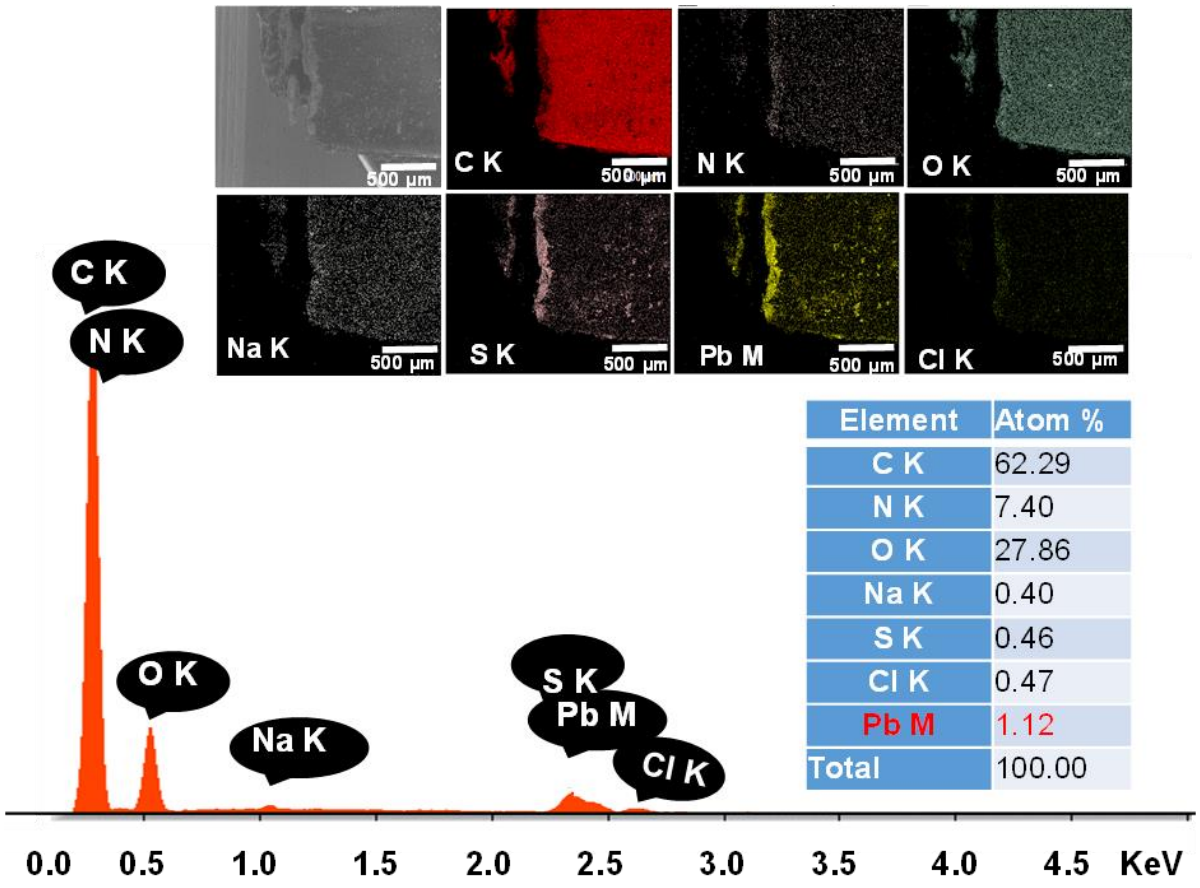

Figure S14. SEM EDS of $Pb(NO_3)_2$ adsorption after single adsorption on the anode. The corresponding SEM and elemental mapping images are shown in the inset.

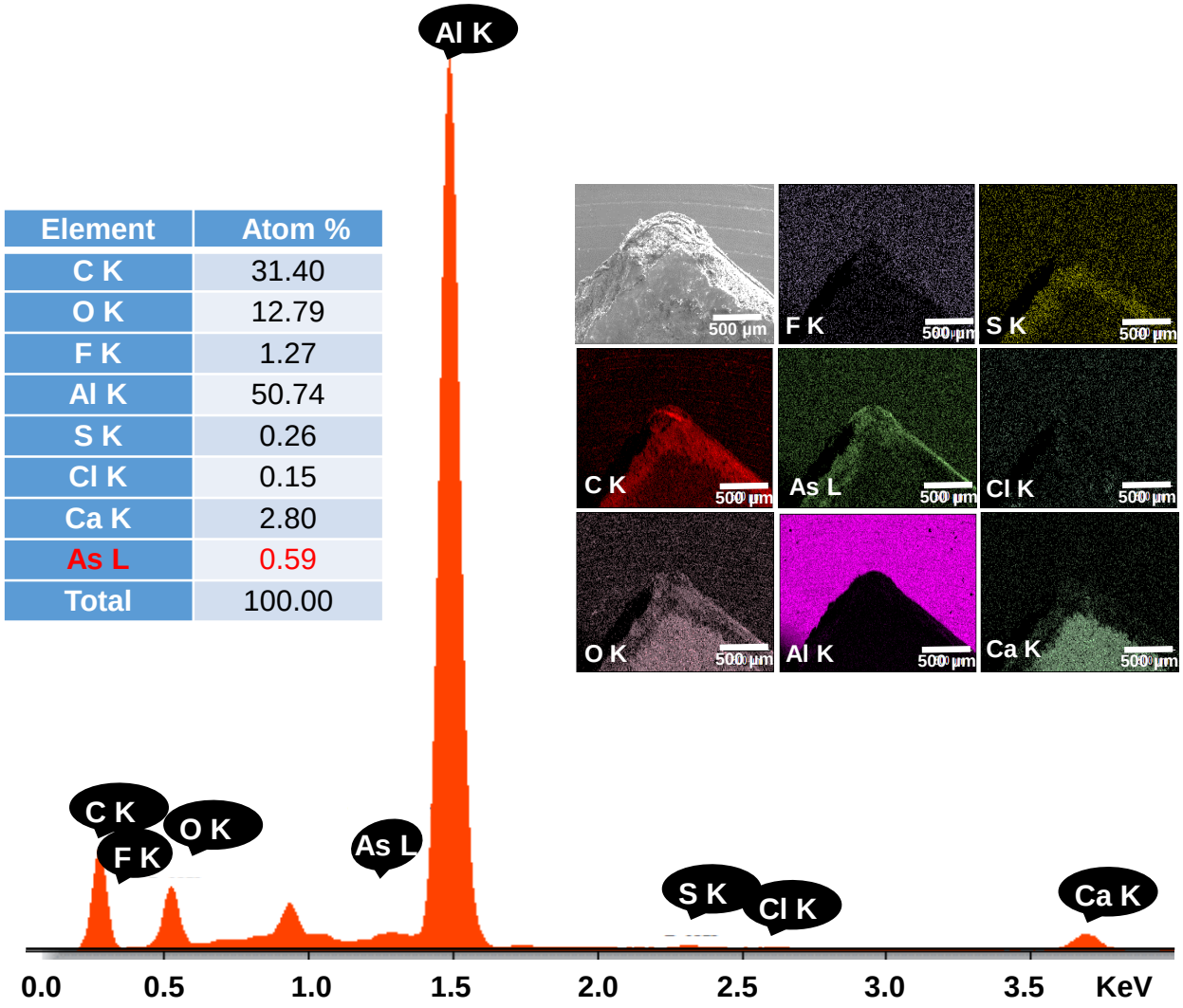

Figure S15. SEM EDS of arsenic adsorption after single adsorption on the cathode. The corresponding SEM and elemental mapping images are shown in the inset.

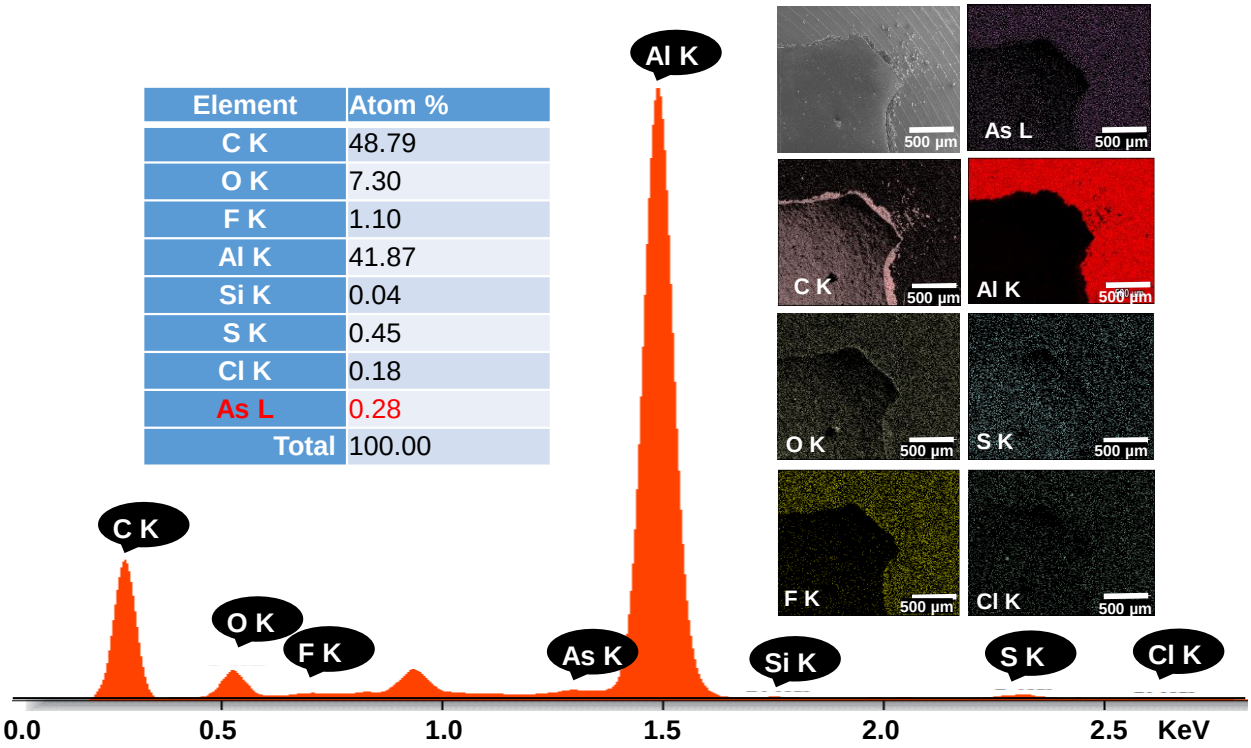

Figure S16. SEM EDS of arsenic adsorption after single adsorption on the anode. The corresponding SEM and elemental mapping images are shown in the inset.

Table S1. Fitting vales of an equivalent circuit of both cathode and anode

Cathode	
R1	12.5 Ohm
Q1	0.06 F.s^(a-1)
a1	0.055
R_{ct}	7 .1 Ohm
C3	16.15e-9 F
R3	1.8 MOhm
C4	0.2905 F
R4	794.3 Ohm

Anode	
R1	38.23 Ohm
Q1	0.04 F.s^(a-1)
a1	0.049
R_{ct}	9 .8 Ohm
C3	16.5e-9 F
R3	5.9 MOhm
C4	0.275 F
R4	831.4 Ohm