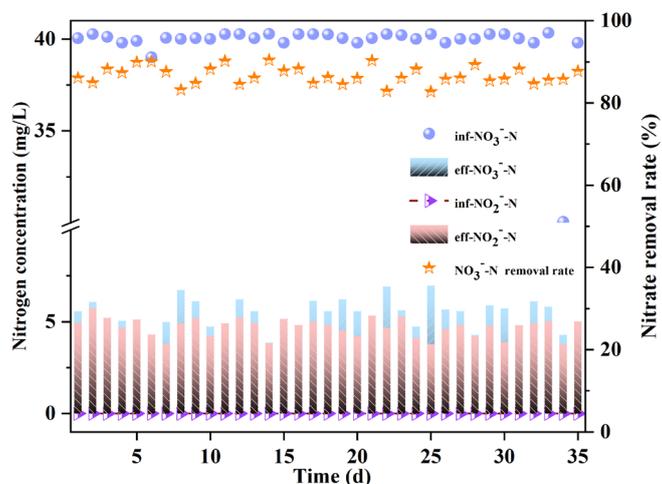


## Supplementary Materials

### (1) Nitrate removal from groundwater by EHD (Optimal conditions)



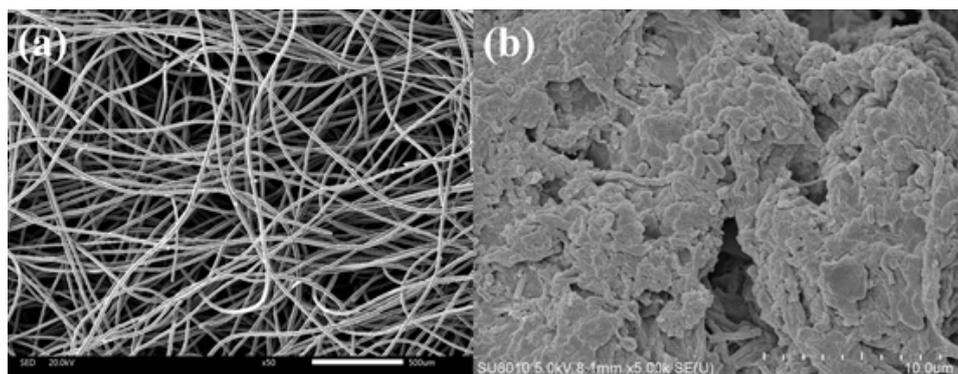
**Figure S1.** Denitrification performance of EHD under optimal conditions.

(I = 86mA, HRT=9h, inf-NO<sub>3</sub><sup>-</sup>-N=40mg N/L, pH=7.5)

### (2) DNA extraction and Illumina MiSeq sequencing

Biofilm samples were collected from the reactor after 7 days of operation under optimal conditions. DNA was extracted using a PowerSoil DNA extraction kit (MoBio Laboratories, Carlsbad, CA). The bacteria domain was targeted by the V3–V4 region of the 16S rRNA gene with primers 338 F (5'-ACTCCTACGGGAGGCAGCAG-3') and 806 R (5'-GGACTACHVGGGTWICTAAT-3'). Then the purified amplicons were pooled in equimolar, and paired-end sequenced (2 × 300) on an Illumina MiSeq platform (Illumina, San Diego, USA) according to the standard protocols (Majorbio, Shanghai, China).

### (3) SEM of carbon felt in SHD-EHD



**Figure S2.** SEM of carbon felt in SHD-EHD: (a) bare Carbon felt; (b) Carbon felt after reaction.

(4) Denitrification performance of EHD at different currents

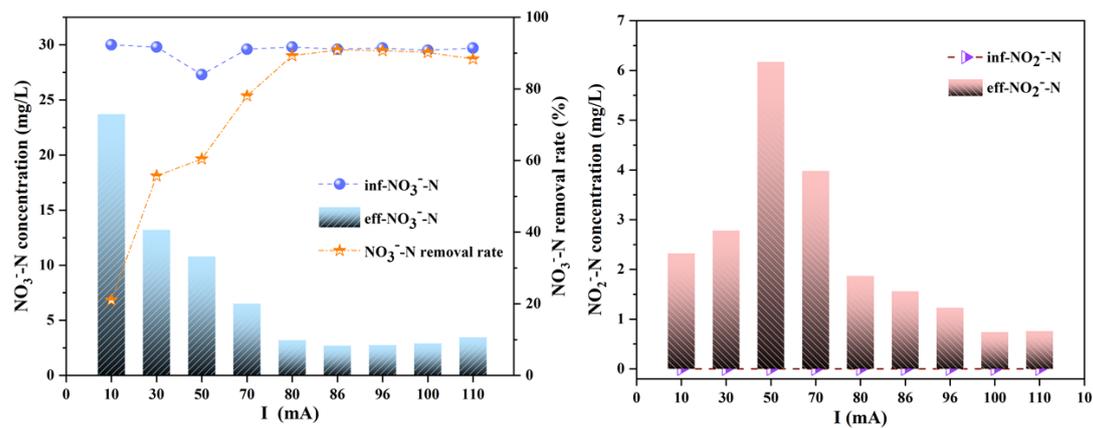


Figure S3. Effect of different current on  $\text{NO}_3^-$ -N and  $\text{NO}_2^-$ -N concentrations.  
(HRT=10 h, pH $\approx$ 7.5, inf-  $\text{NO}_3^-$ -N=30 mg N/L)

(5) Denitrification performance of EHD at different HRT

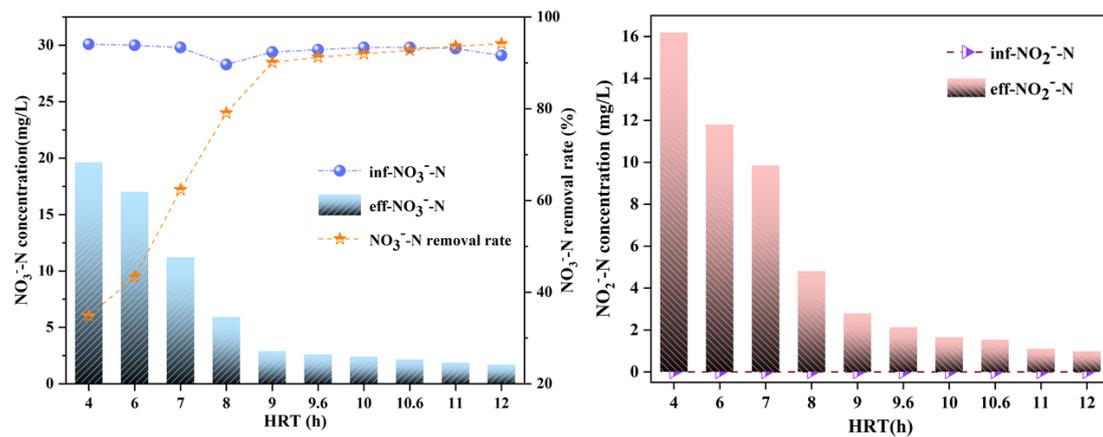


Figure S4. Effect of different HRT on  $\text{NO}_3^-$ -N and  $\text{NO}_2^-$ -N concentrations.  
(I = 86mA, pH $\approx$ 7.5, inf-  $\text{NO}_3^-$ -N=30 mg N/L)

(6) Denitrification performance of EHD at different inf-pH

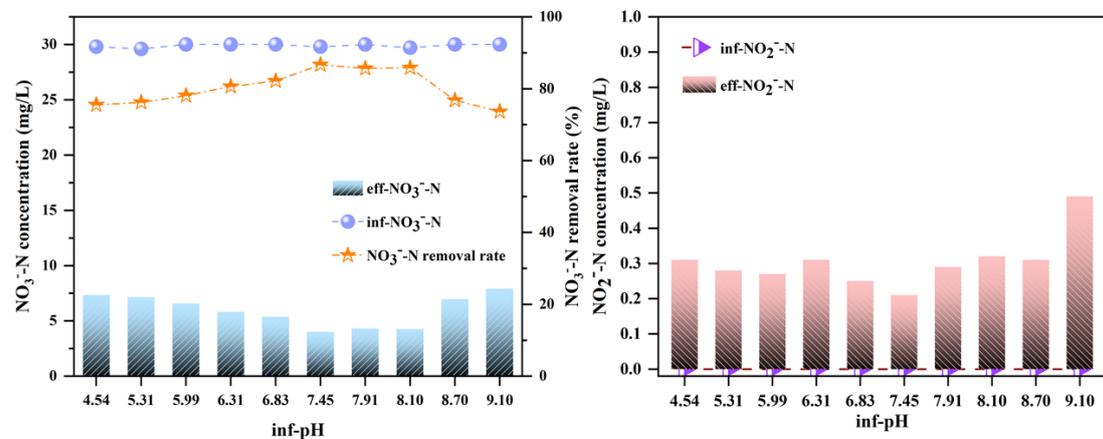


Figure S5. Effect of different pH on  $\text{NO}_3^-$ -N and  $\text{NO}_2^-$ -N.  
(I = 86mA, HRT=9h, inf- $\text{NO}_3^-$ -N=30 mg N/L)

(7) Buffering effect of pH in EHD

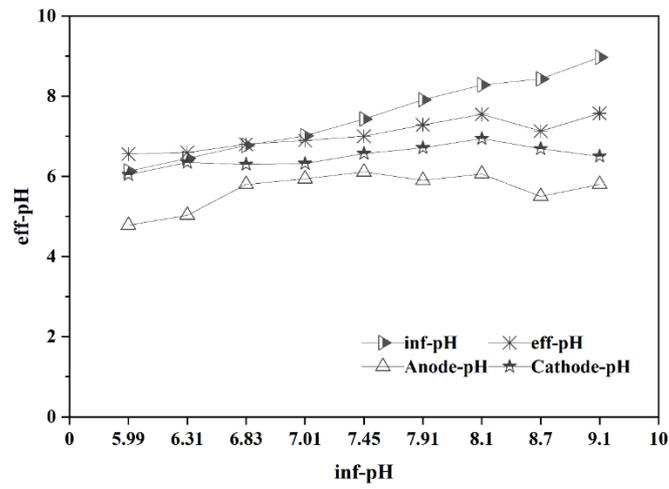


Figure S6. Effect of influent pH on anode, cathode and effluent pH of EHD.

(8) Denitrification performance of EHD at different inf-NO<sub>3</sub><sup>-</sup>-N

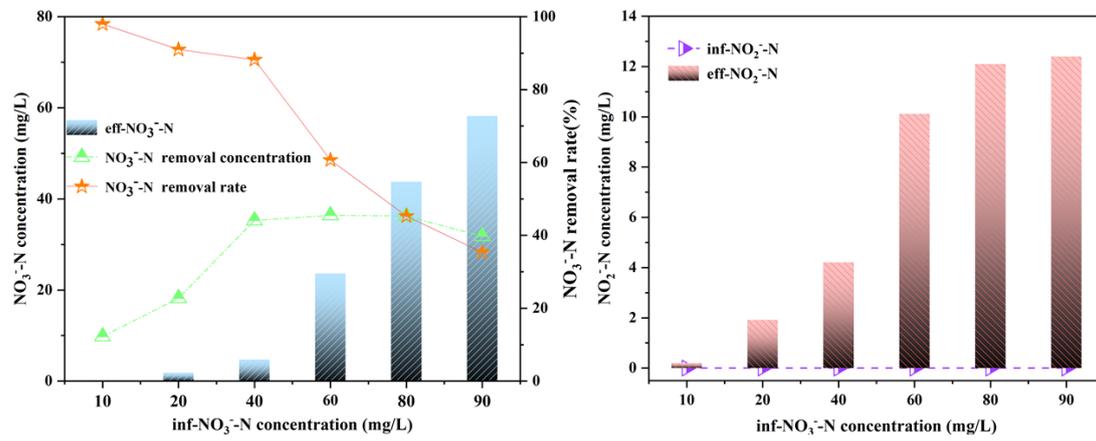


Figure S7. Effect of different inf-NO<sub>3</sub><sup>-</sup>-N on NO<sub>3</sub><sup>-</sup>-N and NO<sub>2</sub><sup>-</sup>-N concentrations.

(I = 86mA, HRT=9h, pH=7.5)