

## Supplementary Information

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### 1. Determination of NH<sub>3</sub>

Sodium hydroxide (NaOH, AR) and ammonium sulphate ((NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>, AR) were purchased from Sinopharm Chemical Reagent Co., Ltd. Salicylic acid (SA, 99.5%) was purchased from Shanghai Macklin Biochemical Co., Ltd. Sodium citrate (SC, 98%) and sodium nitroferricyanide (C<sub>5</sub>FeN<sub>6</sub>Na<sub>2</sub>O·2H<sub>2</sub>O, 98.5%) were purchased from Shanghai Yuanye Biotechnology Co., Ltd. 0.05M Sodium hypochlorite (NaClO) standard solution (dissolved in 2M NaOH) was purchased from Jiangbiao Testing Technology Co., Ltd. All of the reagents were used without further purification.

First, the cathode electrolyte was taken and diluted to the detectable range after the reaction. Then, 2ml 1M NaOH solution (containing 5wt% SA and 5wt% SC), 1ml 0.05M NaClO standard solution and 0.2ml 1wt% sodium nitroferricyanide solution were added to 2ml diluted electrolyte. After the mixed solution was left to stand at room temperature for 2h, the absorbance at 655nm was measured with a visible spectrophotometer (INESA 7230G). A series of standard (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub> solutions were employed to obtain the calibration curve (Fig. S1).

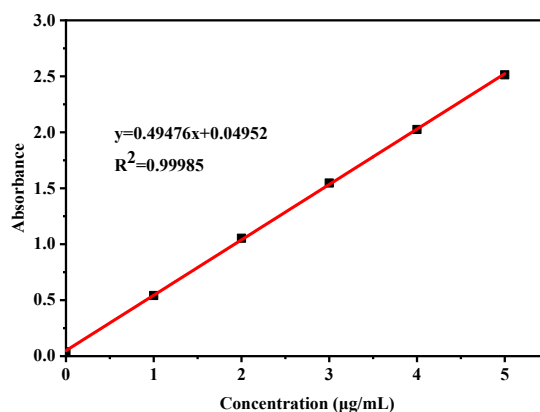


Fig. S1 Calibration curve of absorbance for NH<sub>3</sub> of different concentrations

## 2. Determination of $\text{NO}_2^-$

Phosphoric acid (PA,  $\rho = 1.70 \text{ g mL}^{-1}$ ) and sodium nitrite ( $\text{NaNO}_2$ , AR) were purchased from Sinopharm Chemical Reagent Co., Ltd. N-(1-Naphthyl) ethylenediamine dihydrochloride ( $\text{C}_{12}\text{H}_{14}\text{N}_2 \cdot 2\text{HCl}$ , 98%) was purchased from Shanghai Macklin Biochemical Co., Ltd. P-aminobenzenesulfonamide ( $\text{C}_6\text{H}_8\text{N}_2\text{O}_2\text{S}$ , 99.8%) was purchased from Shanghai Yuanye Biotechnology Co., Ltd. All of the reagents were used without further purification.

First, the cathode electrolyte was taken and diluted to the detectable range after the reaction. Then, 0.1mL color reagent was added to 5ml diluted electrolyte. After the mixed solution was left to stand at room temperature for 20min, the absorbance at 540nm was measured. The color reagent was formed through mixing 4.0g p-aminobenzenesulfonamide, 0.2g N-(1-Naphthyl) ethylenediamine dihydrochloride, 50mL deionized water and 10mL PA ( $\rho = 1.70 \text{ g mL}^{-1}$ ). A series of standard  $\text{NaNO}_2$  solutions were employed to obtain the calibration curve (Fig. S2).

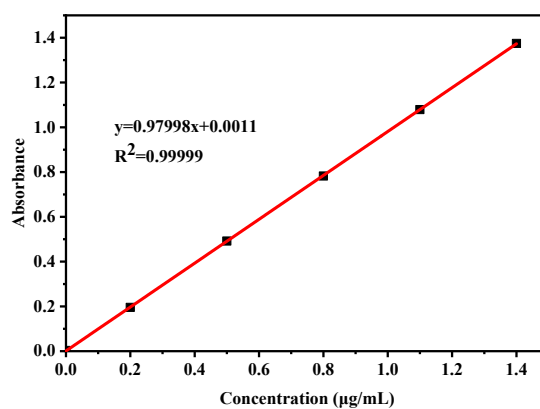


Fig. S2 Calibration curve of absorbance for  $\text{NO}_2^-$  of different concentrations

### 3. Chronoamperometry curves for different catalysts and potentials

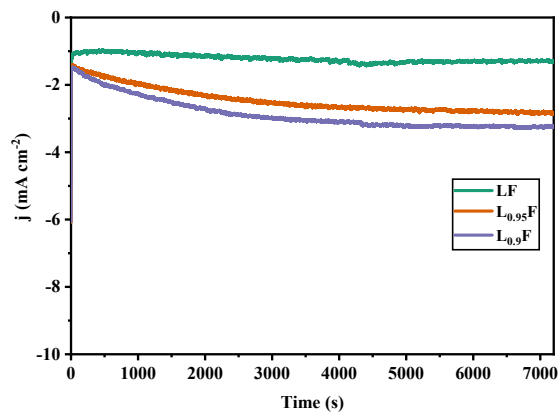


Fig. S3 Chronoamperometry curves of electrocatalytic reducing nitrate on La<sub>x</sub>FeO<sub>3-δ</sub> (x = 1, 0.95, 0.9) catalysts at -0.7 V (vs. RHE)

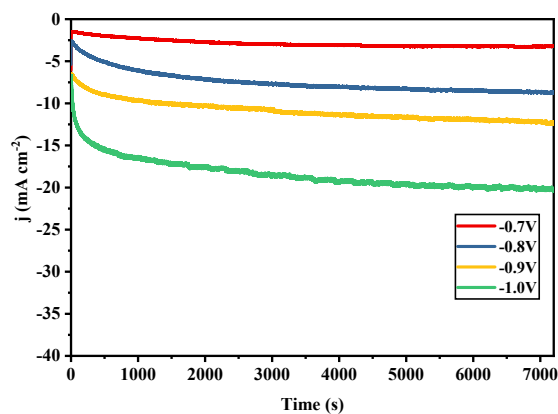


Fig. S4 Chronoamperometry curves of electrocatalytic reducing nitrate on L<sub>0.9</sub>F at different potentials

#### 4. Cyclic voltammetry curves under different scan rates

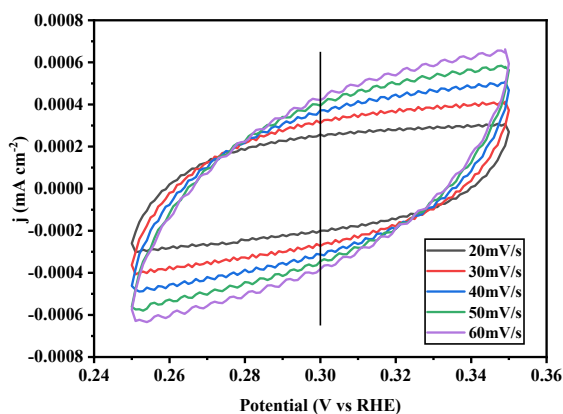


Fig. S5 Cyclic voltammetry curves of electrocatalytic reducing nitrate on LF under different scan rates

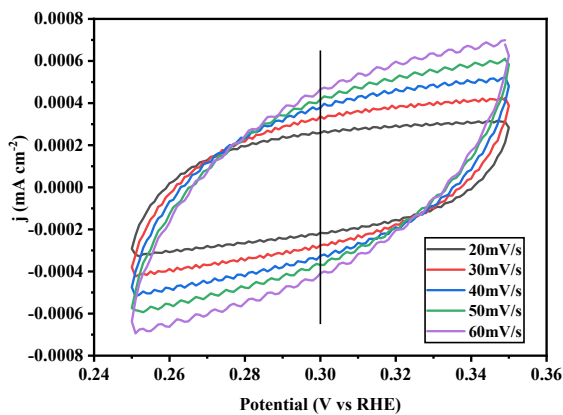


Fig. S6 Cyclic voltammetry curves of electrocatalytic reducing nitrate on  $L_{0.95}F$  under different scan rates

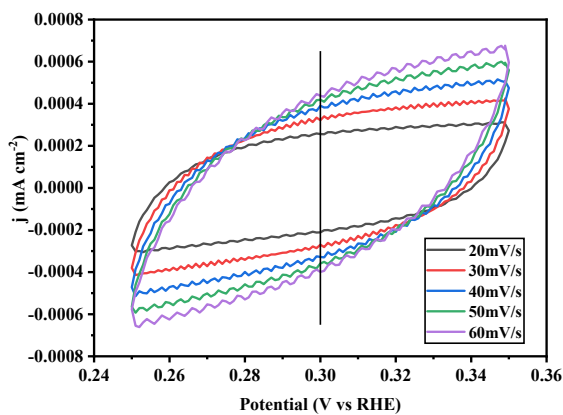


Fig. S7 Cyclic voltammetry curves of electrocatalytic reducing nitrate on  $L_{0.9}F$  under different scan rates