Supporting information for

Promoting effect of potassium on ammonia production from electrochemical nitrate reduction over nano-crystal nickel

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Fig. S1 (a) LSV curves of Ni/CF with and without NO$_2^-$; (b) NH$_3$ yield rate and FE in 0.1M NO$_2^-$ at various potentials over Ni/CF.

Fig. S2 SAED pattern of Ni/CF.
Fig. S3 XPS survey spectra of Ni/CF.

Fig. S4 LSV curves of Ni/CF with and without $K^+$ in electrolyte omitting the $NO_3^-$.
Fig. S5 (a) The effects of $K^+$ on the NRA performance on the CF (-0.79 V vs. RHE, 0.1M $NO_3^-$); (b) The performance changed with the ratios of TBA concentration to $NO_3^-$ -N concentration (0, 5, 10, 20, and 30) on the CF.

Fig. S6 The solution resistance ($R_s$) and charge transfer resistance ($R_{ct}$) of the Ni/CF catalyst by EIS.
Fig. S7 CV curves of the Ni/CF in the electrolyte containing (a) 0%, (b) 25%, (c) 50% (d) 75%, and (e) 100% K^+.

Fig. S8 In-situ Raman spectroscopy of Ni/CF in (a) 50% K^+, (b) 100% K^+ in electrolyte at various potentials (0.01 ~ -0.99 V vs. RHE).
Fig. S9 The proposed promoting mechanism of K$^+$ for NH$_3$ electrosynthesis on CF.