Supporting information for

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

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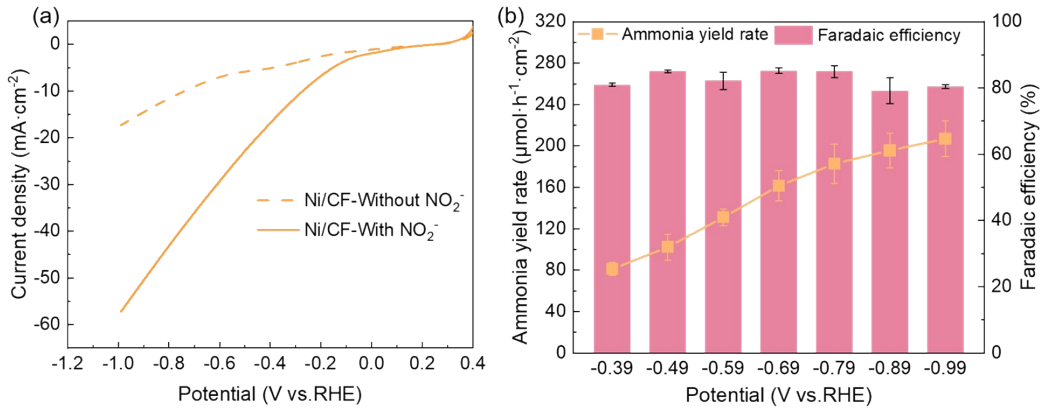

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23 **Fig. S1** (a) LSV curves of Ni/CF with and without NO_2^-; (b) NH_3 yield rate and FE in

24 0.1M NO_2^- at various potentials over Ni/CF.

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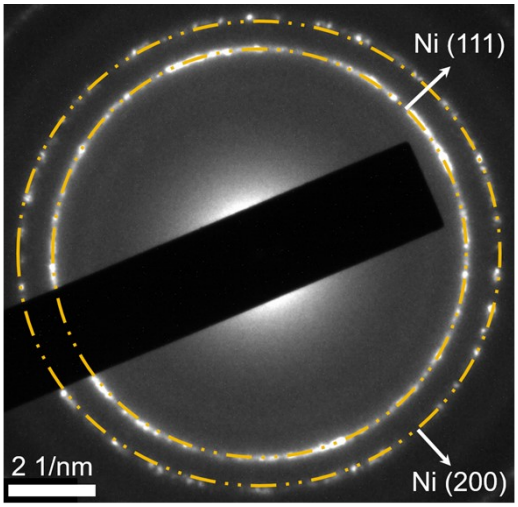

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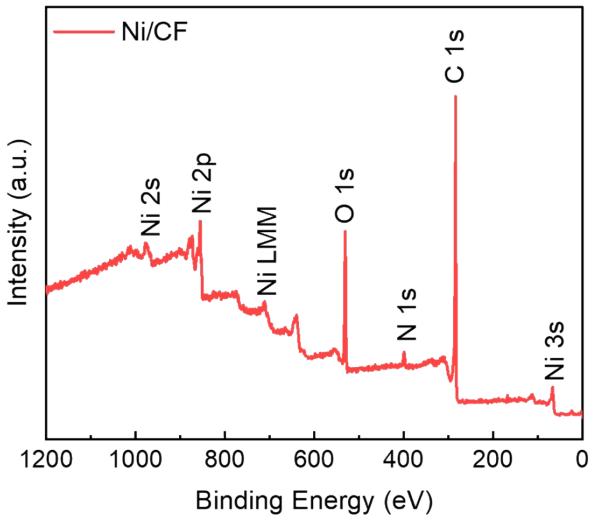
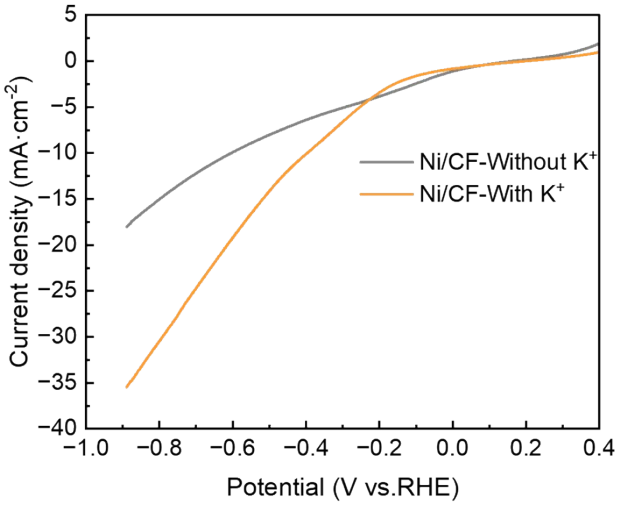
27 **Fig. S2** SAED pattern of Ni/CF.



28

29 **Fig. S3** XPS survey spectra of Ni/CF.



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31 **Fig. S4** LSV curves of Ni/CF with and without K^+ in electrolyte omitting the NO_3^-.

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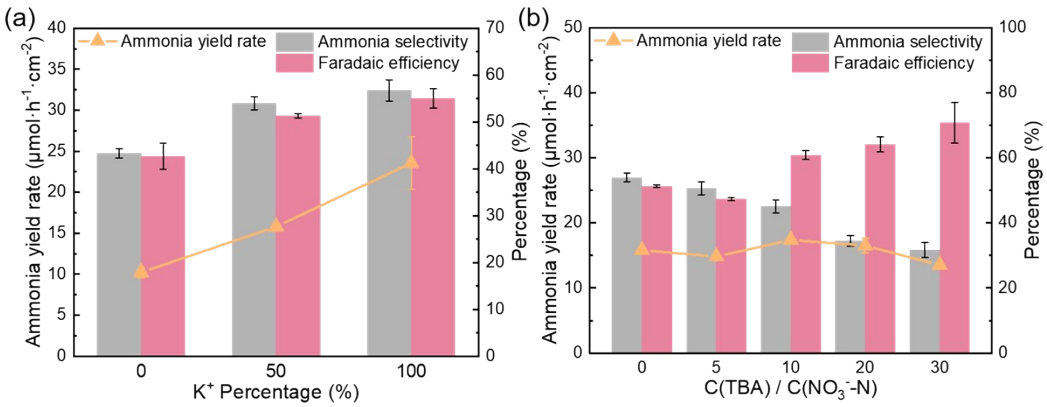

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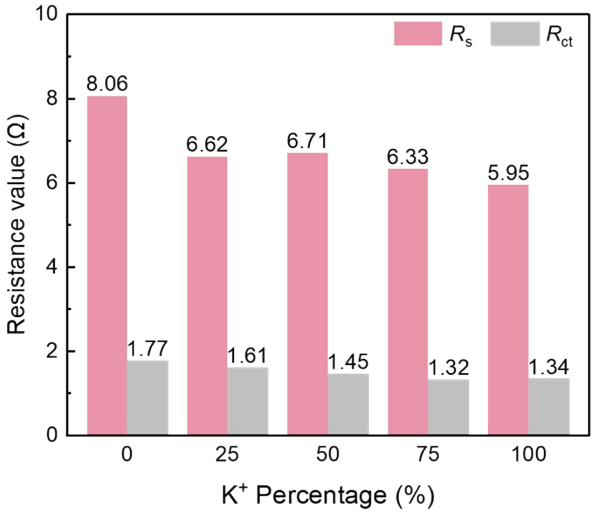
34 **Fig. S5** (a) The effects of K^+ on the NRA performance on the CF (-0.79 V vs. RHE,

35 0.1M NO_3^-); (b) The performance changed with the ratios of TBA concentration to NO_3^-

36 -N concentration (0, 5, 10, 20, and 30) on the CF.



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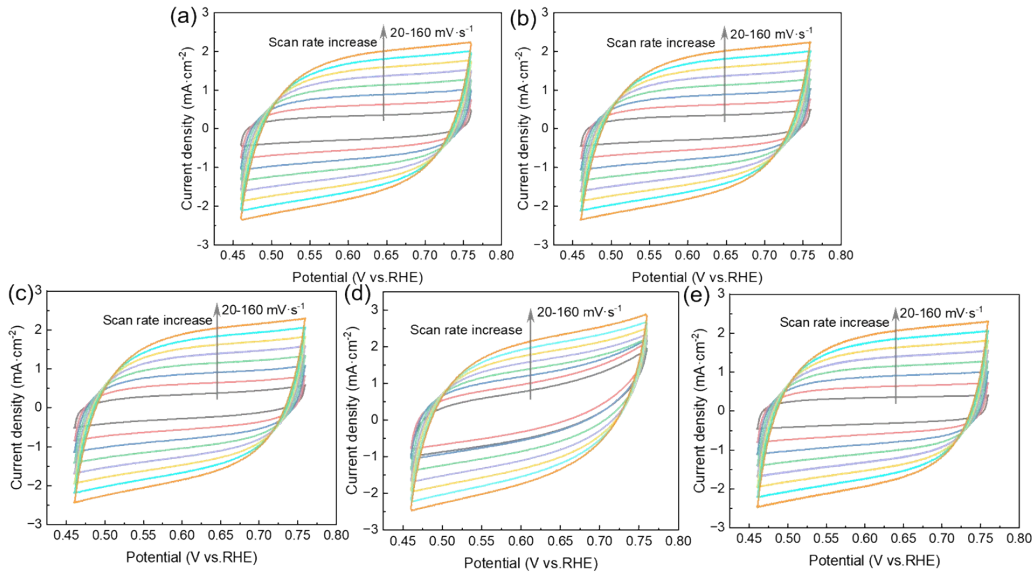
38 **Fig. S6** The solution resistance (R_s) and charge transfer resistance (R_{ct}) of the Ni/CF

39 catalyst by EIS.



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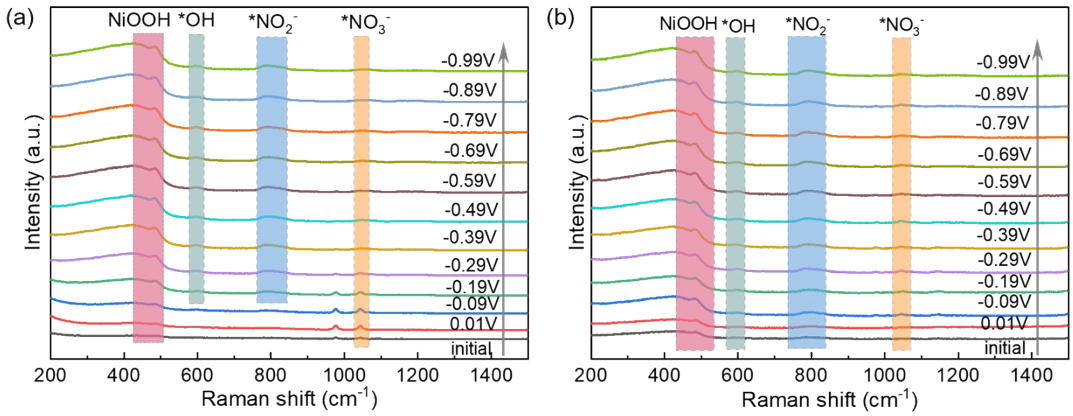
41 **Fig. S7** CV curves of the Ni/CF in the electrolyte containing (a) 0%, (b) 25%, (c) 50%

42 (d) 75%, and (e) 100% K^+.



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44 **Fig. S8** *In-situ* Raman spectroscopy of Ni/CF in (a) 50% K^+, (b) 100% K^+ in electrolyte

45 at various potentials (0.01 ~ -0.99 V vs. RHE).

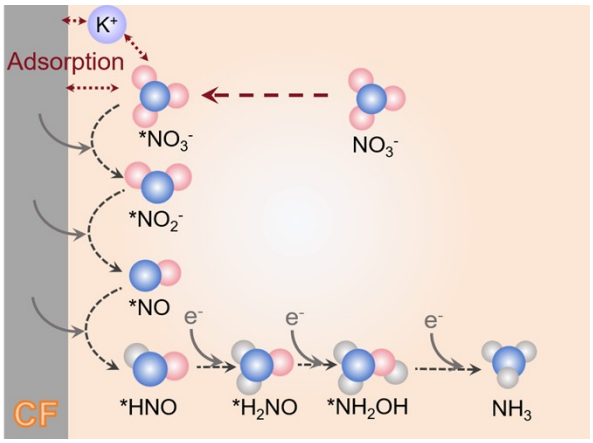

Fig. S9 The proposed promoting mechanism of K^+ for NH_3 electrosynthesis on CF.