Supporting Information

Synergistic Effect by N-Doped Layered Double Hydroxide Derived NiZnAl Oxides in CO_2 Electroreduction

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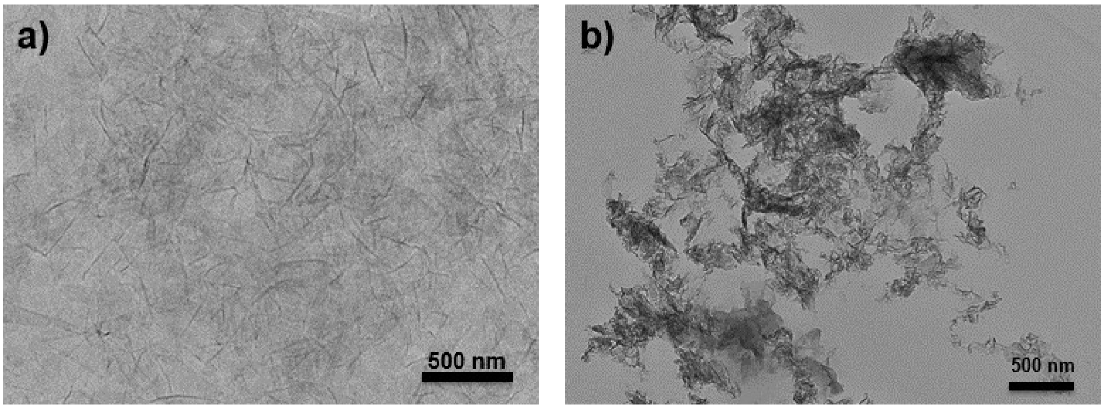

Figure S1. TEM images of a) GO and b) RGO.

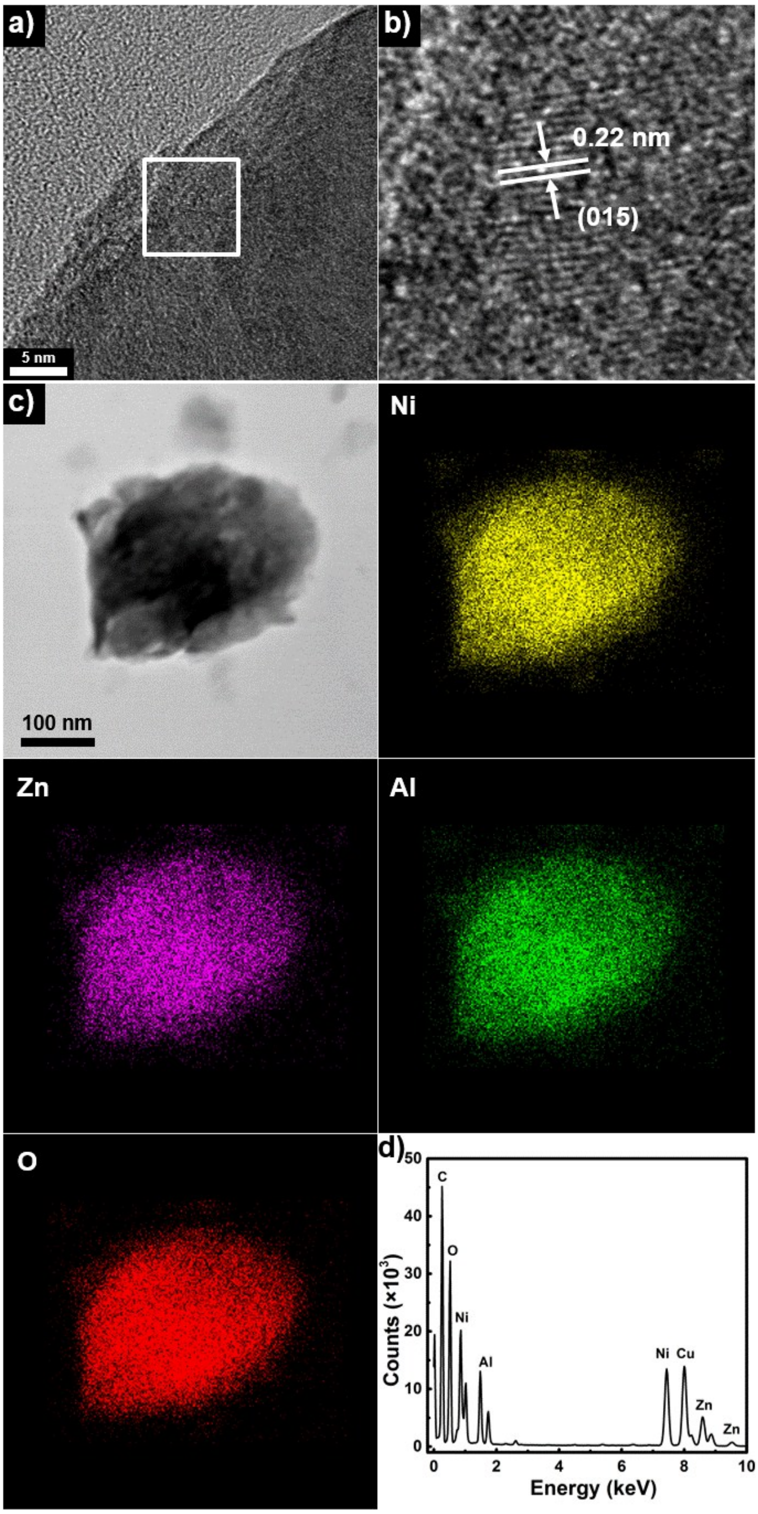

Figure S2. a) HRTEM image of NiZnAl LDH. b) Enlarged view of the square area in Figure a. c) Elemental mapping images for Ni, Zn, Al and O. f) Energy spectrum of selected area.

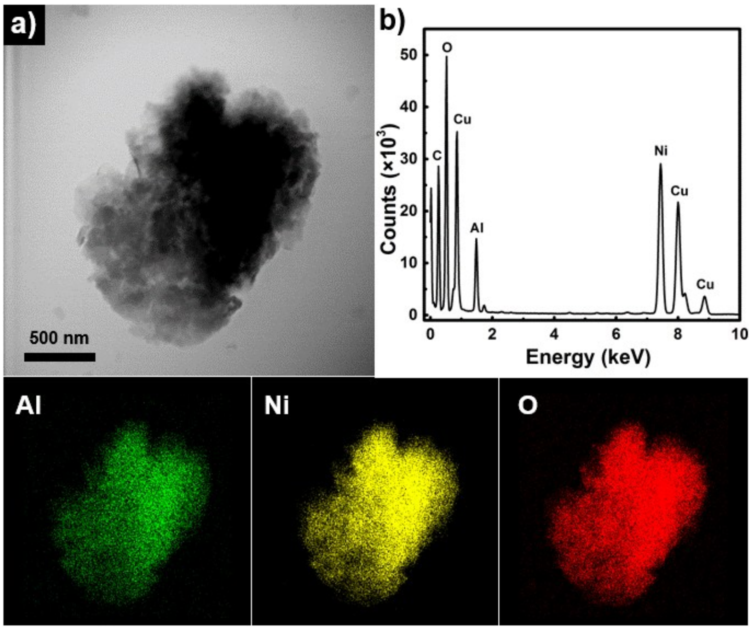

Figure S3. a) Elemental mapping images of NiAl LDH for Ni, Al and O. b) Energy spectrum of selected area.

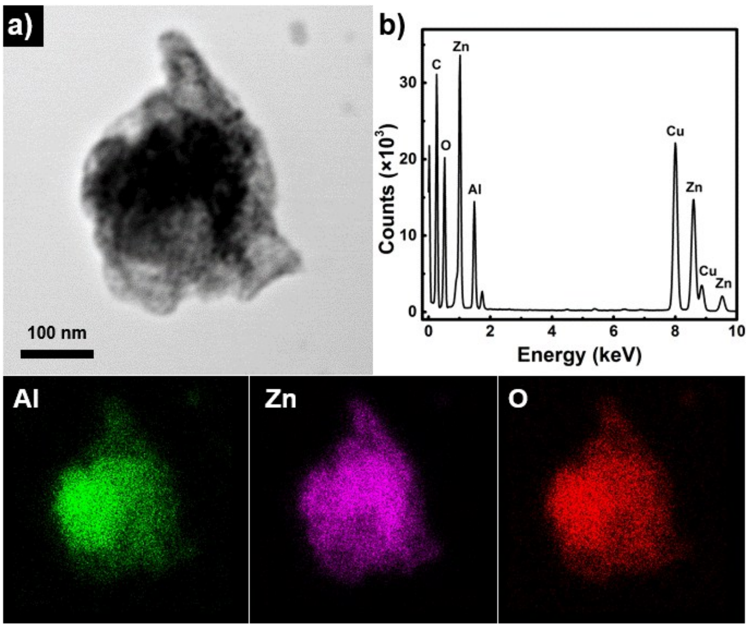

Figure S4. a) Elemental mapping images of ZnAl LDH for Zn, Al and O. b) Energy spectrum of selected area.

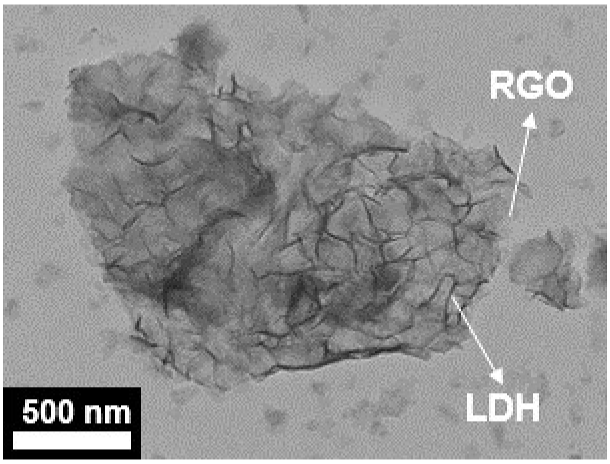

Figure S5. TEM image of NiZnAl LDH/RGO.

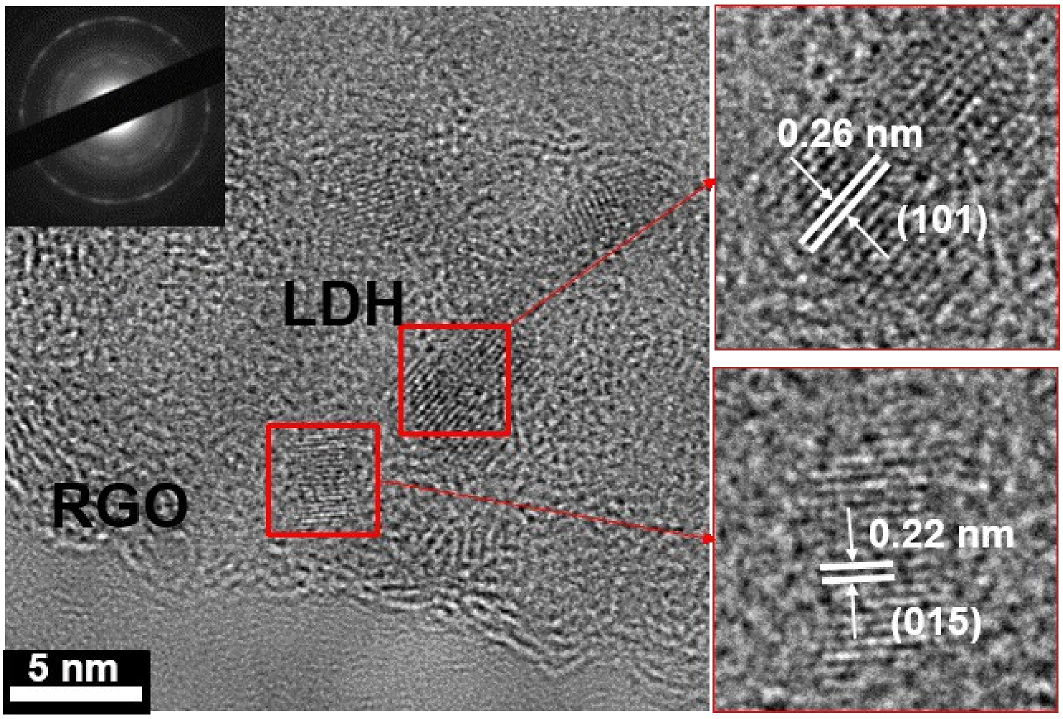

Figure S6. High resolution TEM images of NiZnAl-LDH/RGO. (The upper left corner of the image is the diffraction pattern of graphene.)

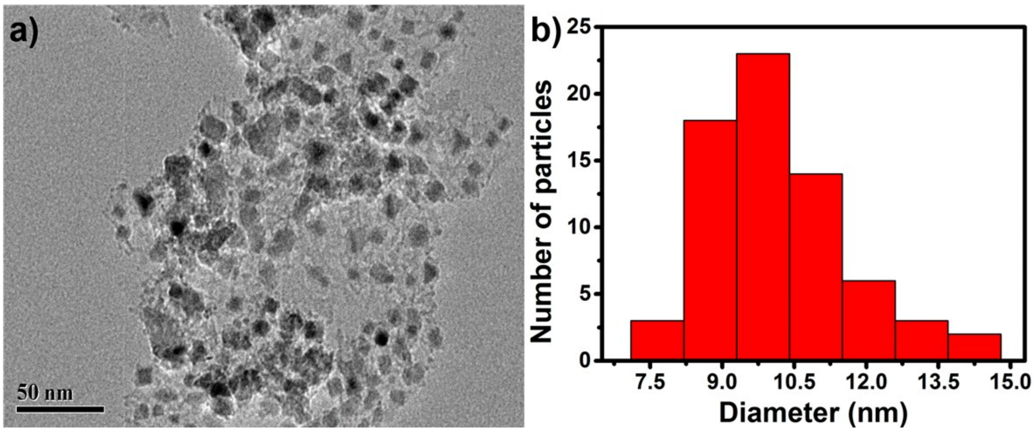

Figure S7. a) TEM image of N-NiZnAl CLDH/RGO b) The diameter distribution of nanoparticles (NiO and ZnO).

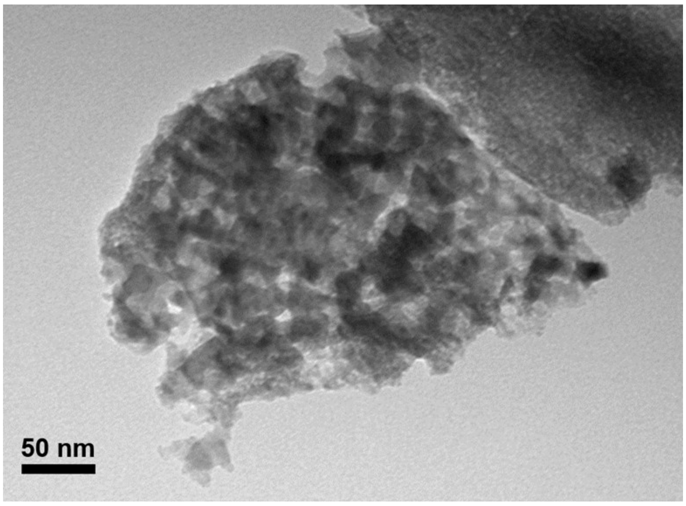

Figure S8. TEM image of N-ZnAl CLDH/RGO.

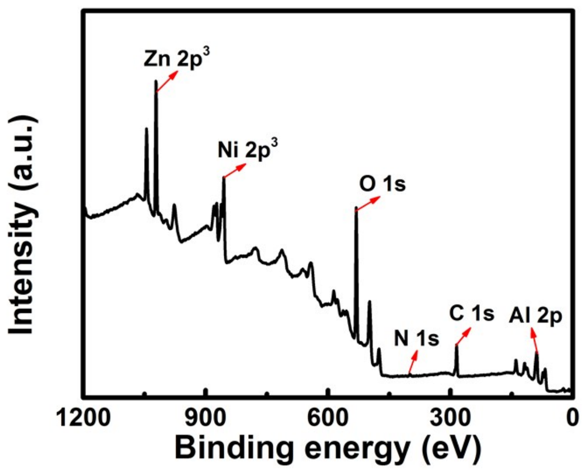

Figure S9. Survey spectrum of XPS for N-NiZnAl CLDH/RGO

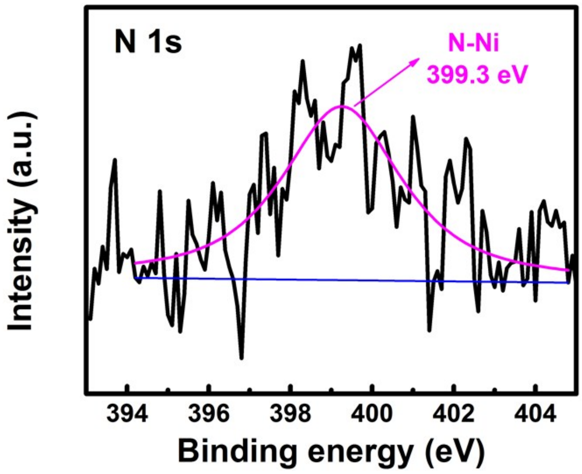

Figure S10. XPS spectra of N 1s for pure Ni_3N.

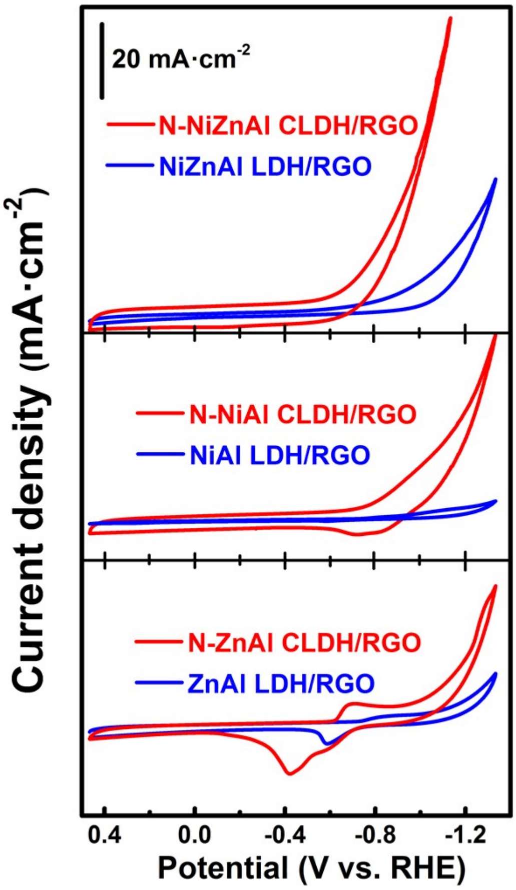

Figure S11. CVs of N doped vs undoped materials in CO_2 saturated 0.5 mol/L NaCl solution.

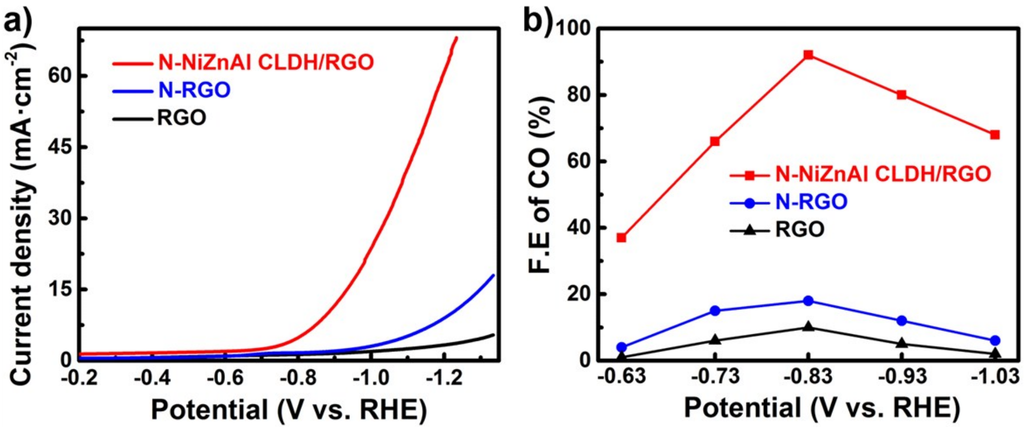

Figure S12. a) LSVs of N-NiZnAl CLDH/RGO, N-RGO and RGO in CO_2 saturated 0.5 M NaCl solution at a scan rate of 50 mV/s. b) Faradaic efficiency of CO by N-NiZnAl CLDH/RGO, N-RGO and RGO.

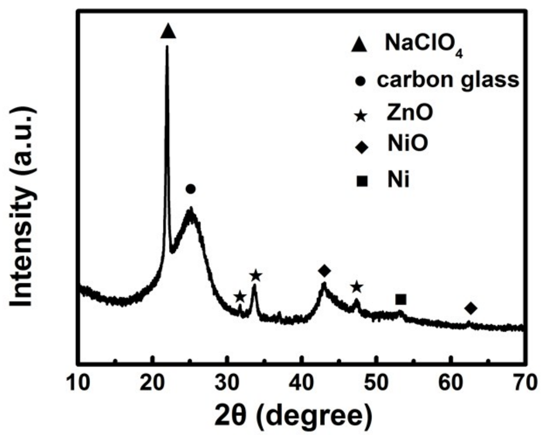

Figure S13. XRD pattern of N-NiZnAl CLDH/RGO after electrolysis in 0.5 M NaCl solution. ($NaClO_4$ was derived from the electrolysis in NaCl.)

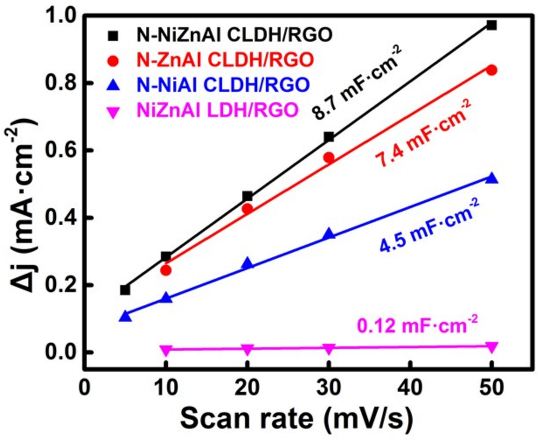

Figure S14. Charging current density plotted vs scan rate of various catalysts.