Supporting Information

Nucleophilic deposition behavior of metal anodes

Yuqian Li [a, b], Jie Shu[a], Liyuan Zhang [a, *]

[a] *School of Materials Science and Chemical Engineering, Ningbo University, Ningbo 315211, China*

[b] *School of Energy and Power EngineeringNanjing University of Science and Technology, Nanjing, 210094, China*

*Corresponding authors.

E-mail addresses: zhangliyuan@nbu.edu.cn

Keywords: Nucleophilic deposition, Inducibility, Gibbs free energy, Alkali metal batteries, Overpotential

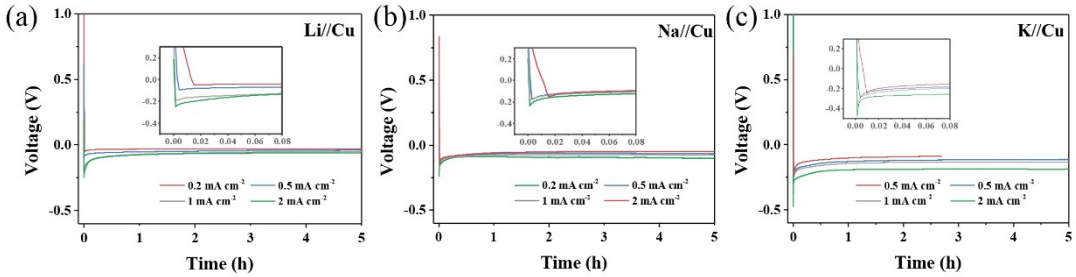


Figure S1 (a) Overpotential of Li^+ deposit on Cu surface at different current density. (b) Overpotential of Na^+ deposit on Cu surface at different current density. (c) Overpotential of K^+ deposit on Cu surface at different current density.

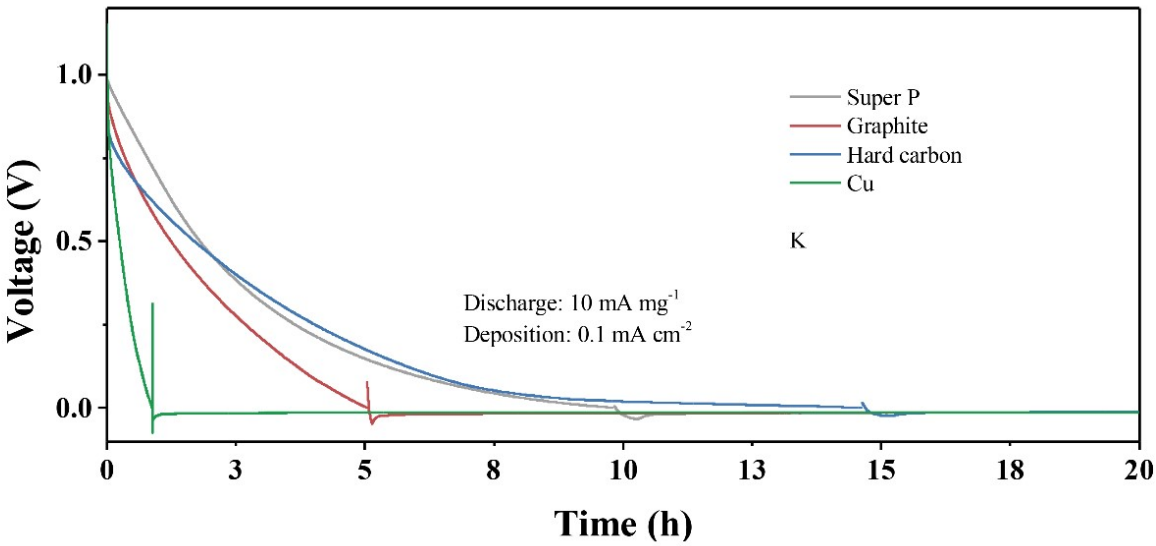


Figure S2 Overpotential of K^+ deposit on Super P, graphite, hard carbon and Cu substrates.

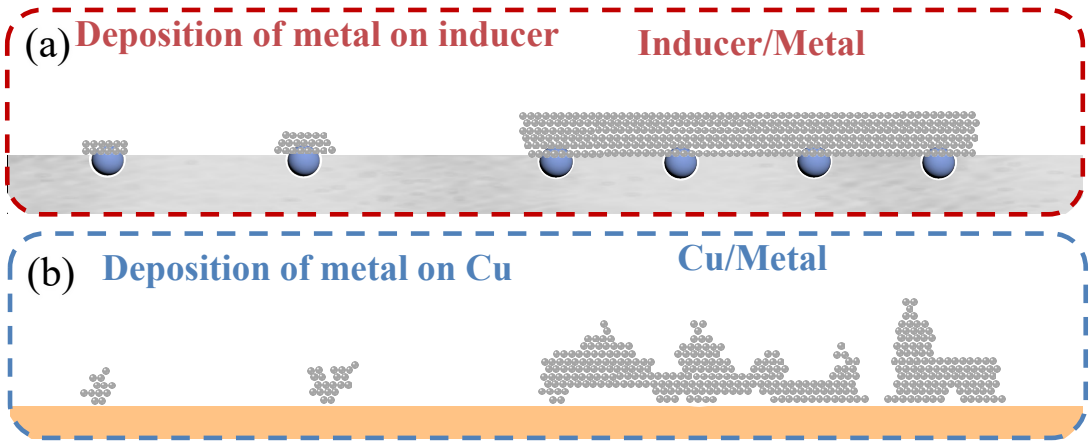


Figure S3 Schematic diagram of (a) nucleophilic deposition behavior and (b) conventional deposition behavior.

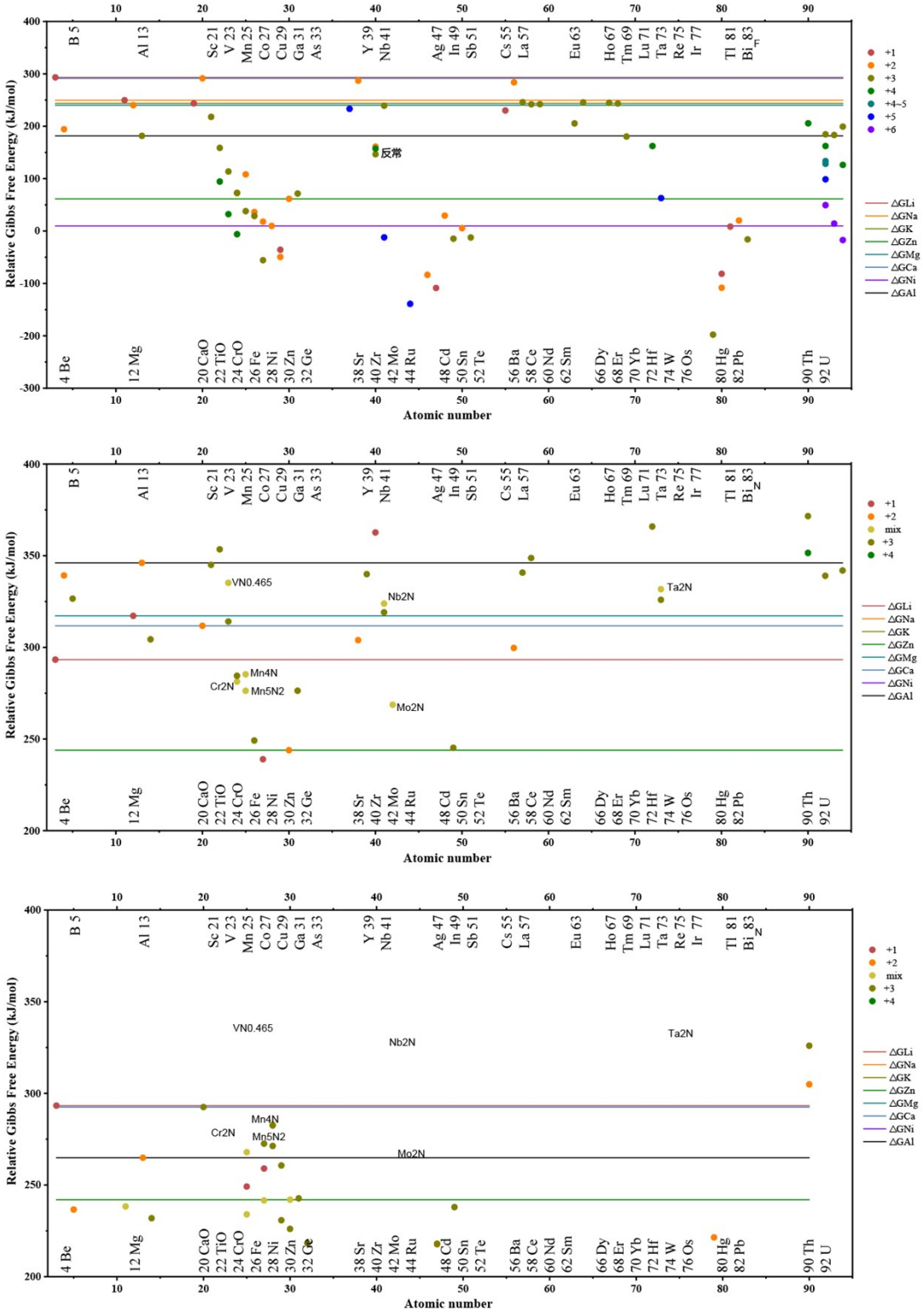


Figure S4 Relative Gibbs free energy of different inducer with different metal valence in oxides, nitride and fluoride.

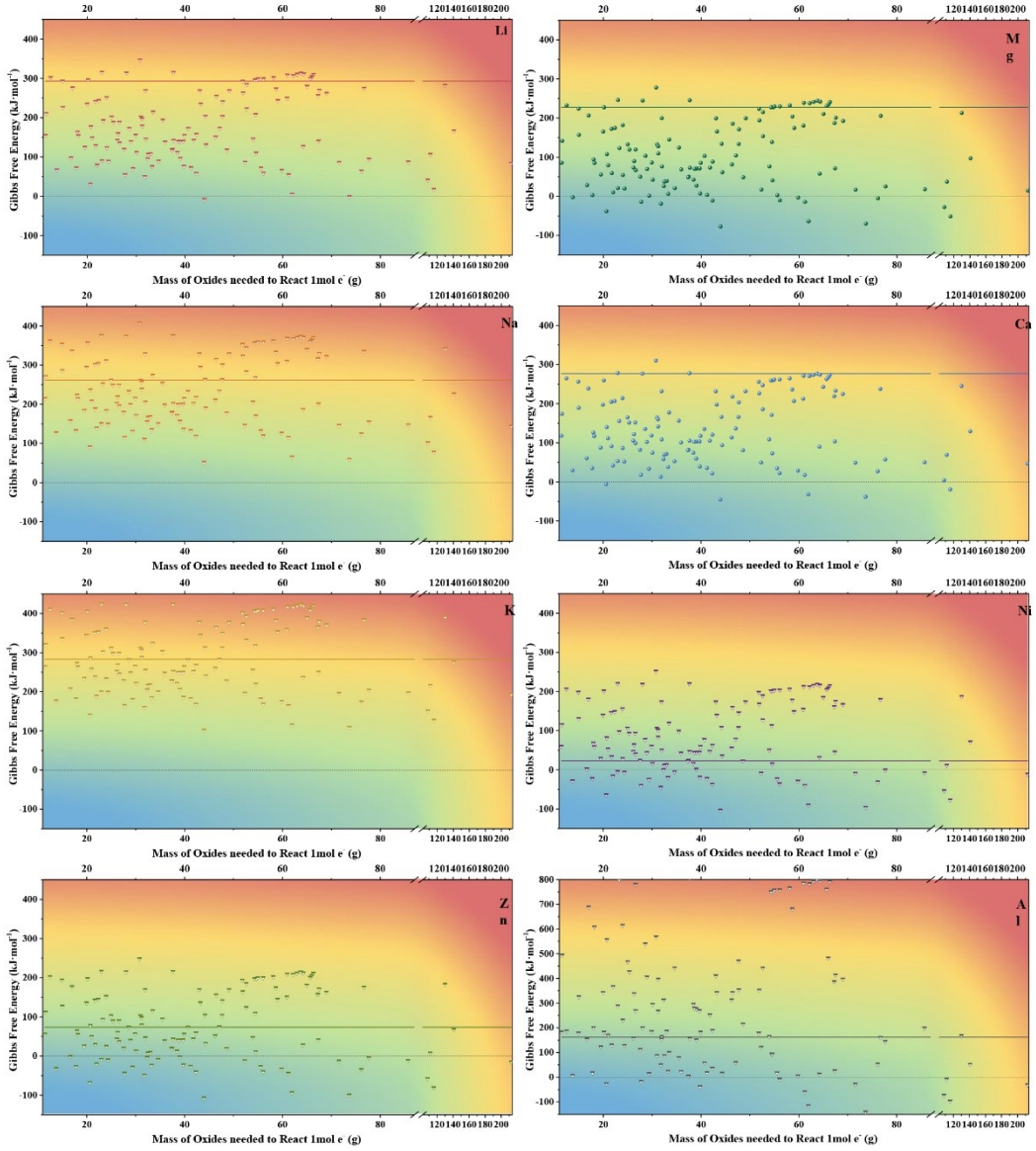


Figure S5 The selection of oxide inducers integrated the inducibility with mass of common metal batteries separately.

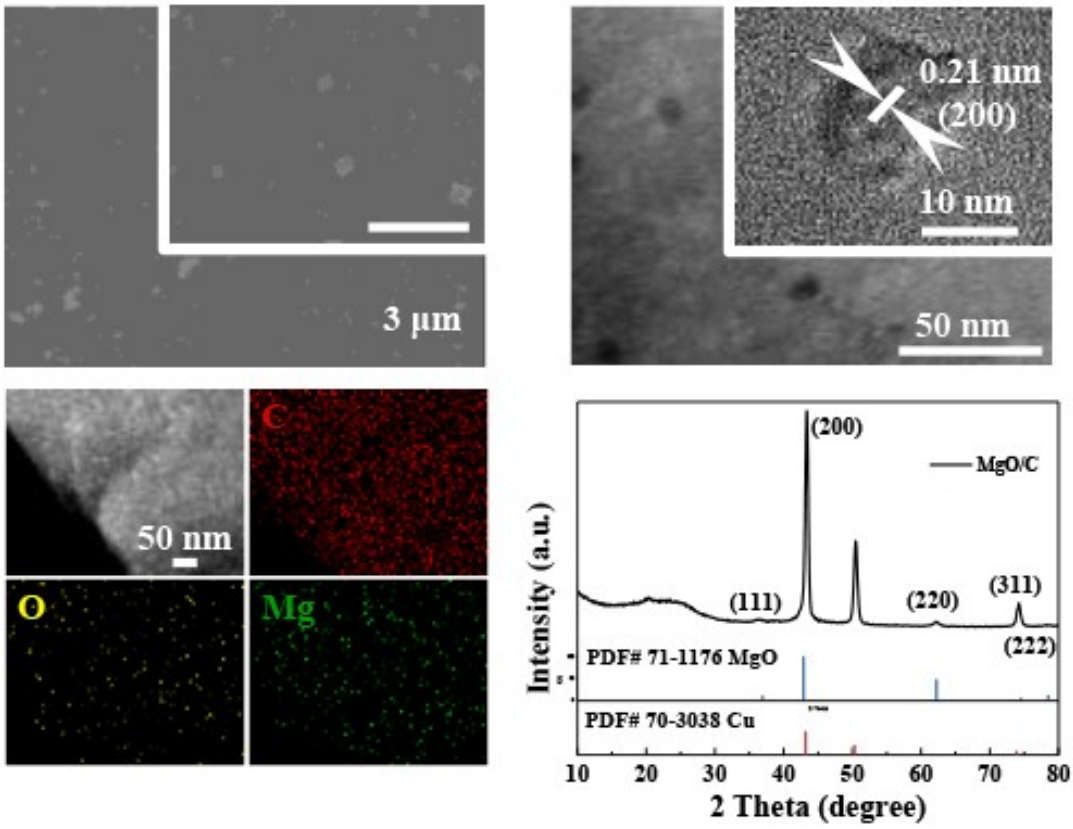


Figure S6 (a) SEM images of carbon substrate with MgO inducer. (b) TEM images of carbon substrate with MgO inducer. (c) Mapping results of carbon substrate with MgO inducer. (d) XRD result of carbon substrate with MgO inducer coated on Cu foil.

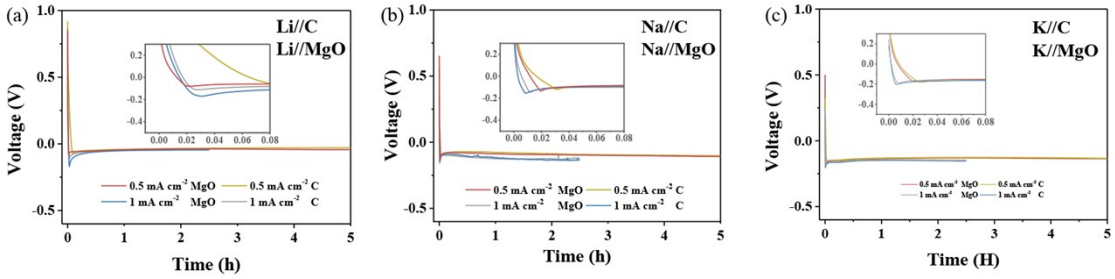


Figure S7 (a) Overpertential of Li^+ deposit on pure carbon and carbon with inducer. (b) Overpertential of Na^+ deposit on pure carbon and carbon with inducer. (c) Overpertential of K^+ deposit on pure carbon and carbon with inducer.

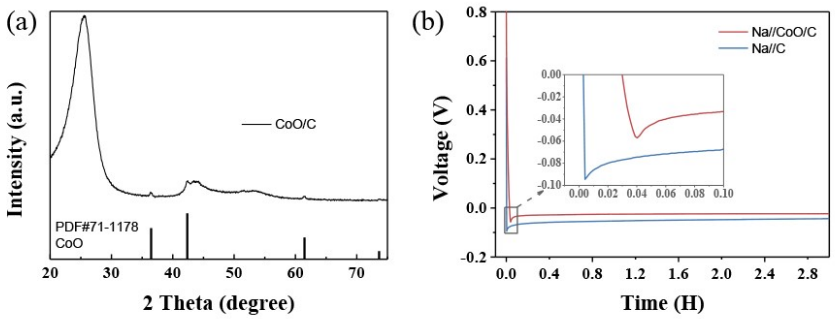
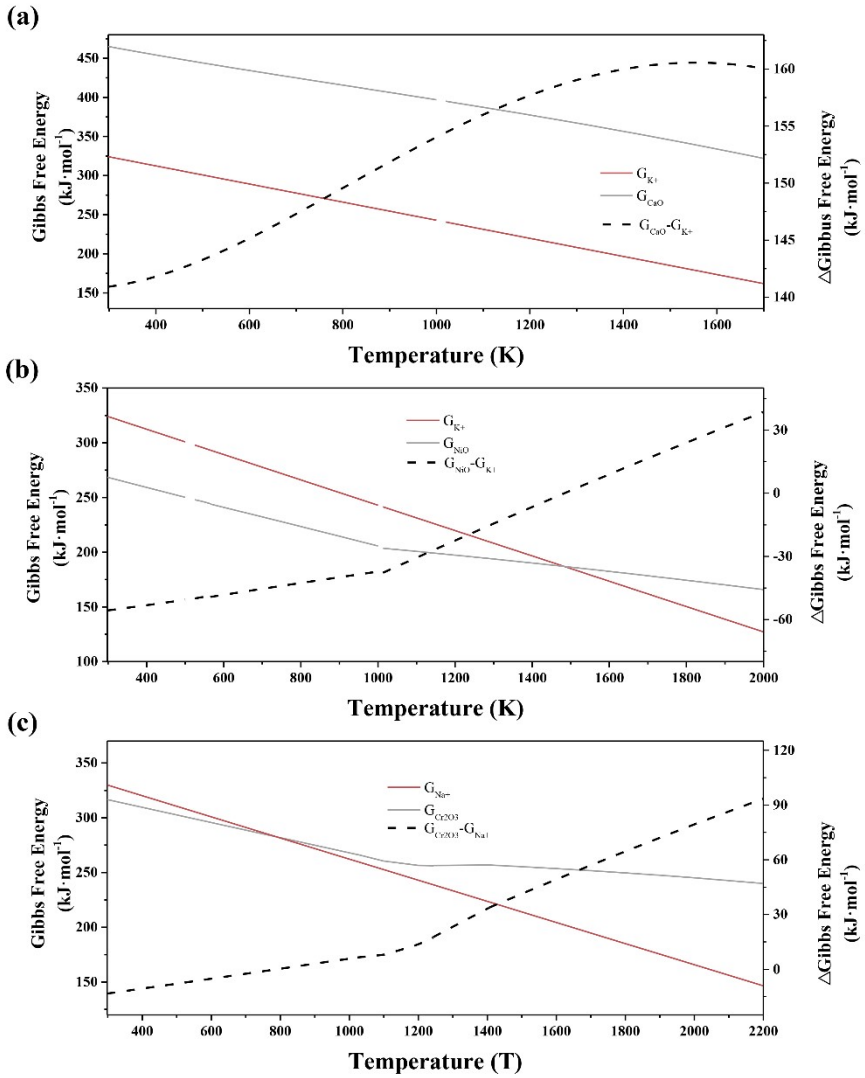


Figure S8 (a) XRD result of carbon substrate with MgO inducer. (b) Overpertential of Na^+ deposit on pure carbon and carbon with inducer.

Figure S9 (a) Inductivity of CaO in K metal batteries at different temperature. (b) Inductivity



of NiO in K metal batteries at different temperature. (c) Inductivity of Cr_2O_3 in Na metal batteries at different temperature.