Electronic Supplementary Information (ESI) for EES Catalysis

Facet-Engineered Photoelectrochemical Nanocatalysts toward Fast Kinetic Lithium-Air

Batteries

Yiqiao Wang ^{a,b,c,d} Siyuan Pan, ^{a,b,c} Huan Li,^e Dewang Li, ^{a,b,c} Yong Guo, ^{a,b,c} Sijia Chi, ^{a,b,c} Chuannan Geng, ^{a,b,c} Shichao Wu ^{a,b,c} * and Quan-Hong Yang ^{a,b,c} *

- Nanoyang Group, Tianjin Key Laboratory of Advanced Carbon and Electrochemical Energy Storage, State Key Laboratory of Chemical Engineering, School of Chemical Engineering and Technology, Tianjin University, Tianjin, 300072, China
- b. National Industry-Education Integration Platform of Energy Storage, Tianjin University, Tianjin 300072, China
- c. Haihe Laboratory of Sustainable Chemical Transformations, Tianjin 300192, China
- d. Department of Materials Science and Engineering, City University of Hong Kong, 83 Tat Chee Avenue, Kowloon, Hong Kong 999077, China
- e. School of Chemical Engineering and Advanced Materials, The University of Adelaide, Adelaide,
 SA 5005, Australia
- *Corresponding Authors

E-mail:

qhyangcn@tju.edu.cn;

wushichao@tju.edu.cn

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Figure S1. SEM image of pristine Fe_2O_3 with irregular shaped.



Figure S2. TEM image of (110) Fe₂O₃ nanoplates.



Figure S3. Schematic diagram of the band positions of (110) Fe_2O_3 and pFe_2O_3 with the equilibrium potential of the Li_2O_2 reaction, where the dotted line indicates pFe_2O_3 and the solid gray line indicates (110) Fe_2O_3 .



Figure S4. The standard curve of RhB solution, in which the concentration was linearly related to the absorbance.



Figure S5. Tafel plots for evaluating the ORR kinetics of catalysts under visible light.



Figure S6. N_2 adsorption-desorption isotherm results of pFe_2O_3 and (110) Fe_2O_3 .



Figure S7. N₂ adsorption-desorption isotherm results of CNT, pFe₂O₃@CNT, and (110) Fe₂O₃@CNT, and their specific area calculated by Brunauer-Emmett-Teller (BET) method according to the points $P/P_0 = 0.05-0.25$.



Figure S8. Raman spectra of the discharged cathode in dark/light conditions.



Figure S9. RRDE measurements for pFe_2O_3 based cathode. LSV curves were measured at 800 rpm with the disc potential step from OCP to 1.8V vs. Li⁺/Li, E_{ring} was held at 3.5 V vs. Li⁺/Li.



Figure S10. C 1s XPS spectra of discharged cathode of (110) Fe₂O₃ under dark/light conditions.



Figure S11. Optimized structure and the corresponding binding energy of O_2 and LiO_2 on (110) and (104) facet of α -Fe₂O₃ by DFT calculations.



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