Supporting Information

Atomically dispersed Cu-N-C as a promising support for low-Pt loading cathode catalysts of fuel cells

Liting Cui, Zhengjian Li, Haining Wang, Lirui Cui, Jin Zhang, Shanfu Lu*, Yan Xiang**

Beijing Key Laboratory of Bio-inspired Energy Materials and Devices, School of Space and Environment, Beihang University, Beijing 100191, P. R. China.

Corresponding emails:hwang@buaa.edu.cn (H. Wang), lusf@buaa.edu.cn (S. Lu), xiangy@buaa.edu.cn (Y. Xiang)

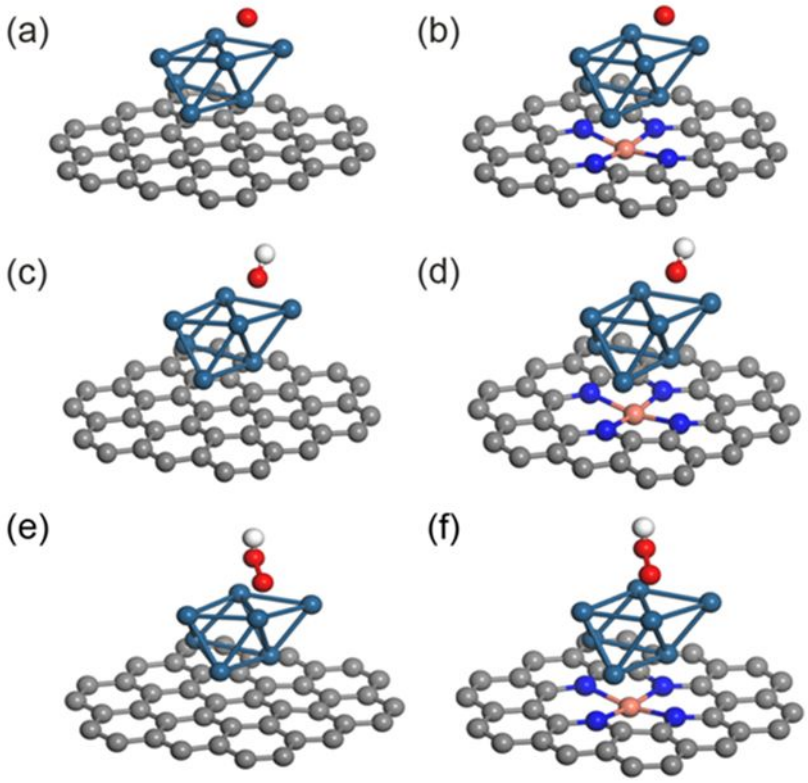

Figure S1. The relaxed adsorption model of (a)-(b) O*, (c)-(d) HO* and (e)-(f) HOO* on Pt/C and Pt/Cu-SAC, respectively. Grey, blue, red, white, cyan and pink balls are C, N, O, H, Pt and Cu atoms, respectively.

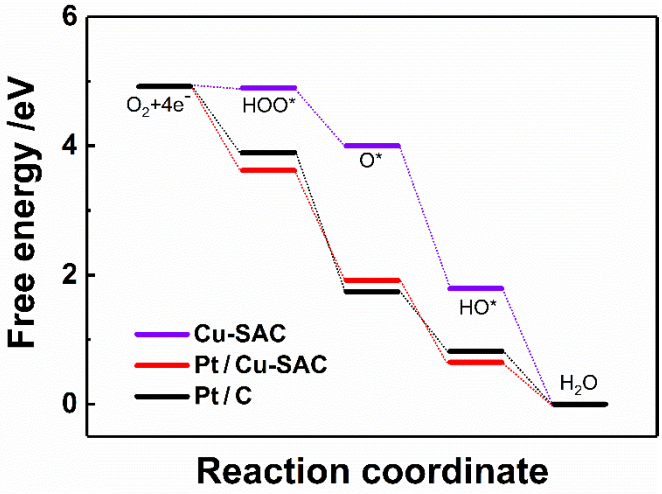

Figure S2. The free energy diagram at 0 V (vs. RHE) for oxygen reduction over Pt/Cu-SAC compared with that over Pt/C or Cu-SAC.

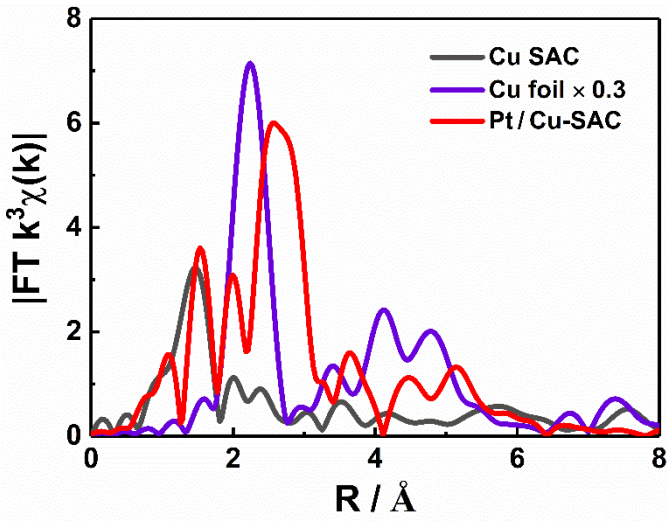

Figure S3. k3-weighted χ(k) function of the extended X-ray absorption fine structure (EXAFS) spectra.

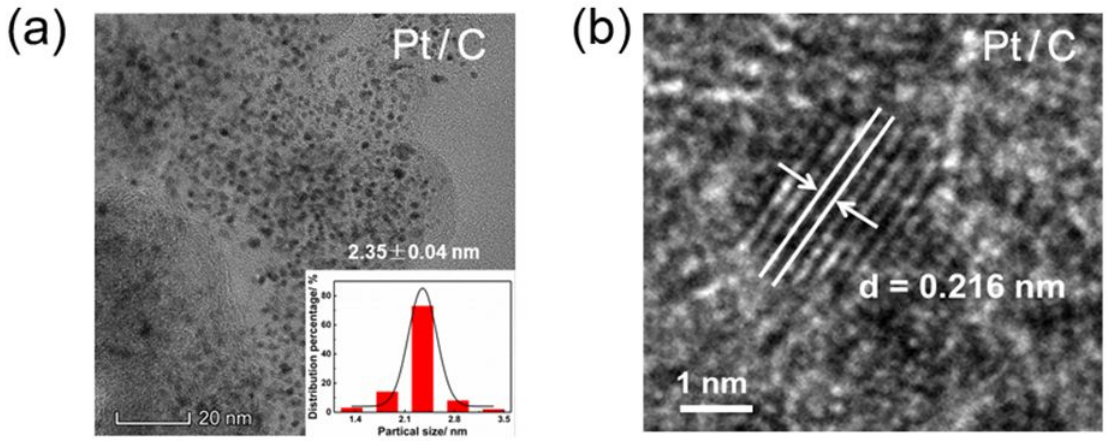

Figure S4. (a) TEM image of the commercial Pt/C (JM, 40 wt%) (insert: Pt particles size distribution). (b) The lattice fringe of Pt in Pt/C.

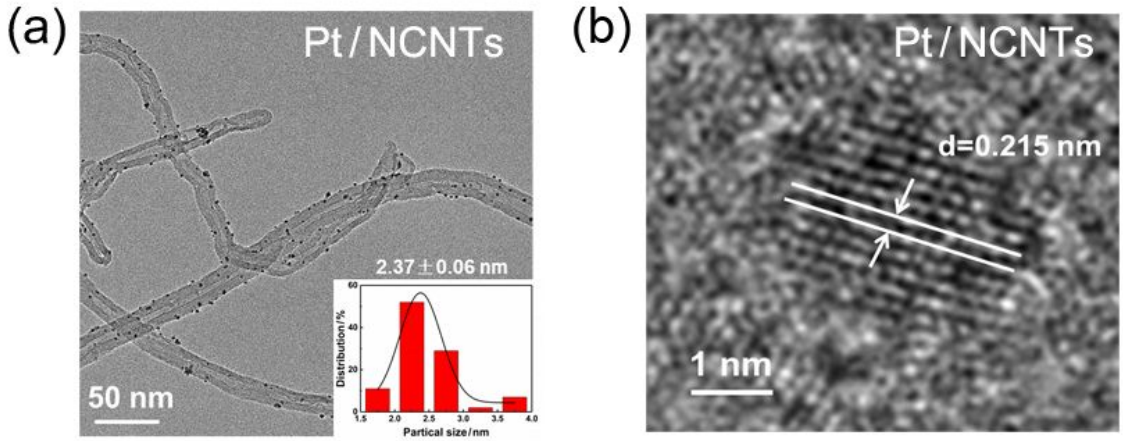

Figure S5. (a) TEM image of Pt/NCNTs (insert: Pt particles size distribution). (b) The lattice fringe of Pt in Pt/NCNTs.

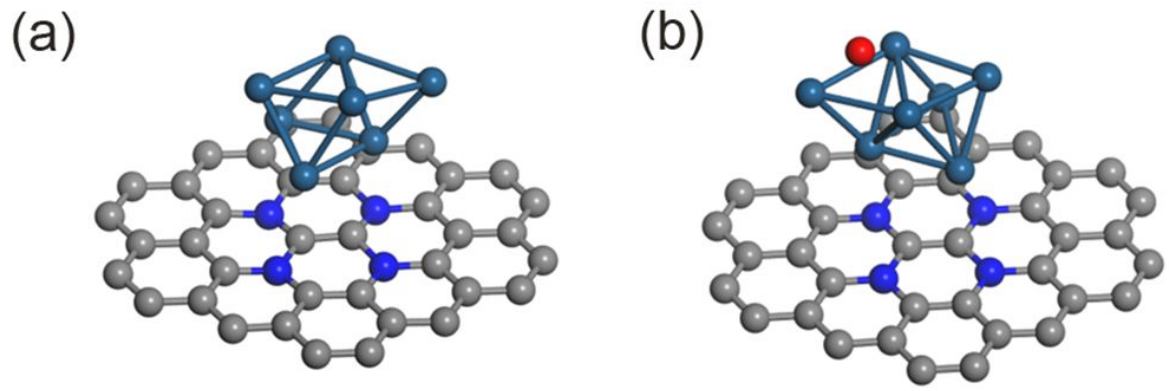

Figure S6. The relaxed adsorption model of (a) Pt/N-C and (b) O* on Pt/NCNTs. Grey, blue, red, white, cyan are C, N, O, H and Pt atoms, respectively.

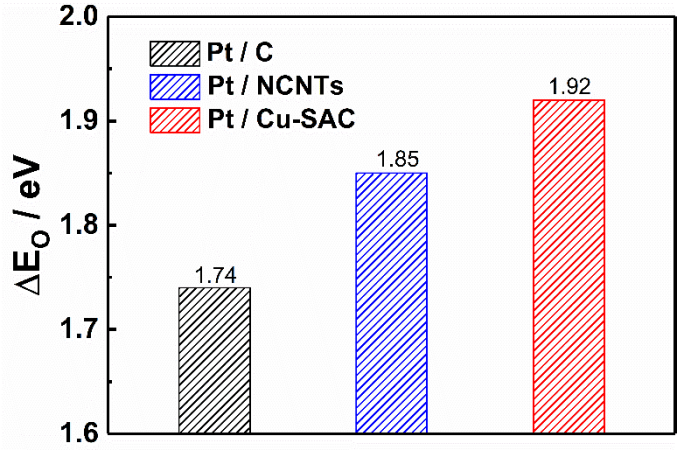

Figure S7. The adsorption energy of oxygen on Pt of Pt/C, Pt/NCNTs, and Pt/Cu-SAC from DFT calculation.

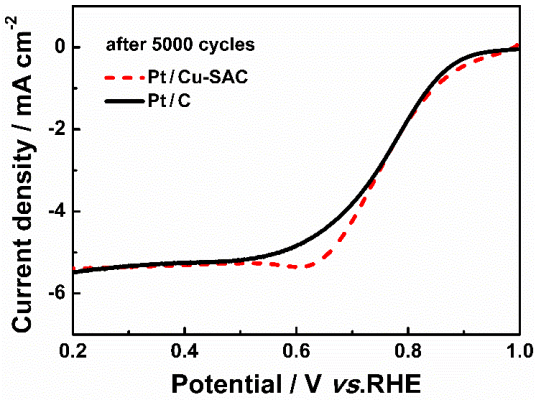

Figure S8. LSV curves of Pt/Cu-SAC in comparison to that of commercial Pt/C (JM, 40 wt%) after a 5000-cycle accelerated durability testing (ADT) measurement in 0.1 mol L^{-1} $HClO_4$ solution.

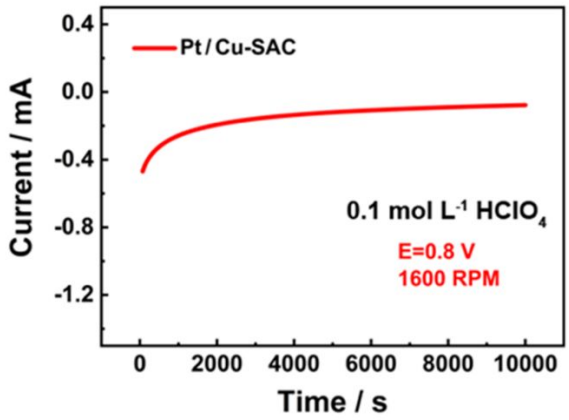

Figure S9. ORR stability of Pt/Cu-SAC over 10,000 s in 0.1 mol L^{-1} $HClO_4$ solution; constant potential of 0.8 V (vs. RHE), 1600 rpm.

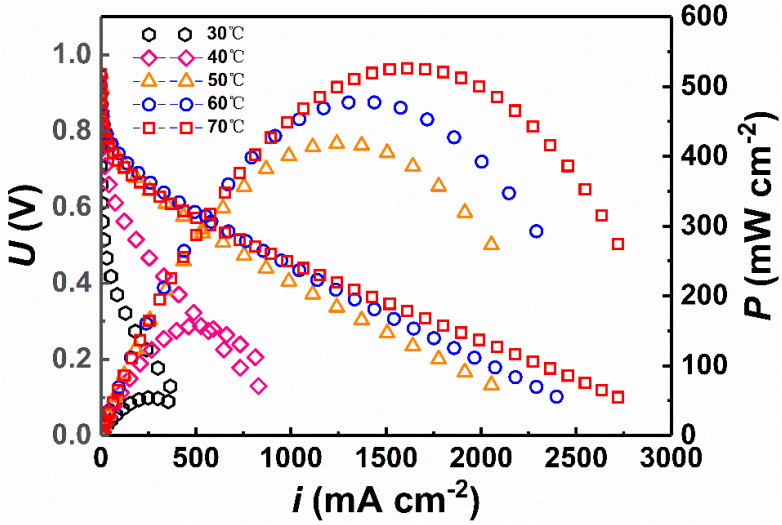

Figure S10. The polarization curves of a proton exchange membrane fuel cell (H_2-O_2) with Pt/Cu-SAC as the cathode catalysts at different temperatures.

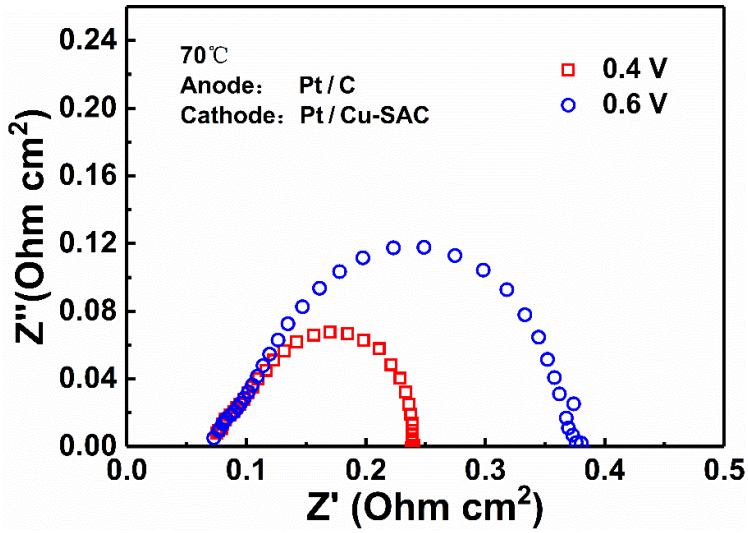

Figure S11. The electrochemical impedance spectroscopy (EIS) of a proton exchange membrane fuel cell (H_2-O_2) with Pt/Cu-SAC as the cathode catalysts at the temperature of 70 °C.