Electronic Supplementary Information (ESI) for RSC Advances

Supplementary Information

Co_9S_8 Activated N/S Co-doped Carbon Tubes in-situ Grown on Carbon Nanofibers for Efficient Oxygen Reduction

Fang Wang, [a,e] *Ting Liu,* [a]* *Yaofang Guo,* [a] *Wenzhen Li,* [b] *Ji Qi,* [c] *David Rooney* [d] *and Kening Sun* [a]*

[a] Beijing Key Laboratory for Chemical Power Source and Green Catalysis, School of Chemical Engineering and Environment, Beijing Institute of Technology, Beijing 100081, China

[b] Chemical and Biological Engineering Department, Iowa State University, Ames, IA50011, USA.

[c] School of Chemical Engineering, Dalian University of Technology, Dalian 116024, China.

[d] School of Chemistry and Chemical Engineering, Queen's University Belfast, Belfast BT9 5AG, UK

[e] Chemistry and Chemical Engineering Department, College of Life, Tarim University, Alar, 843300, China

*Corresponding Author.

Email: bitkeningsun@163.com (Kening Sun)

Tel (Fax): +86-10-68918696

liuting@bit.edu.cn (Ting Liu)

Tel (Fax): +86-10-68918696

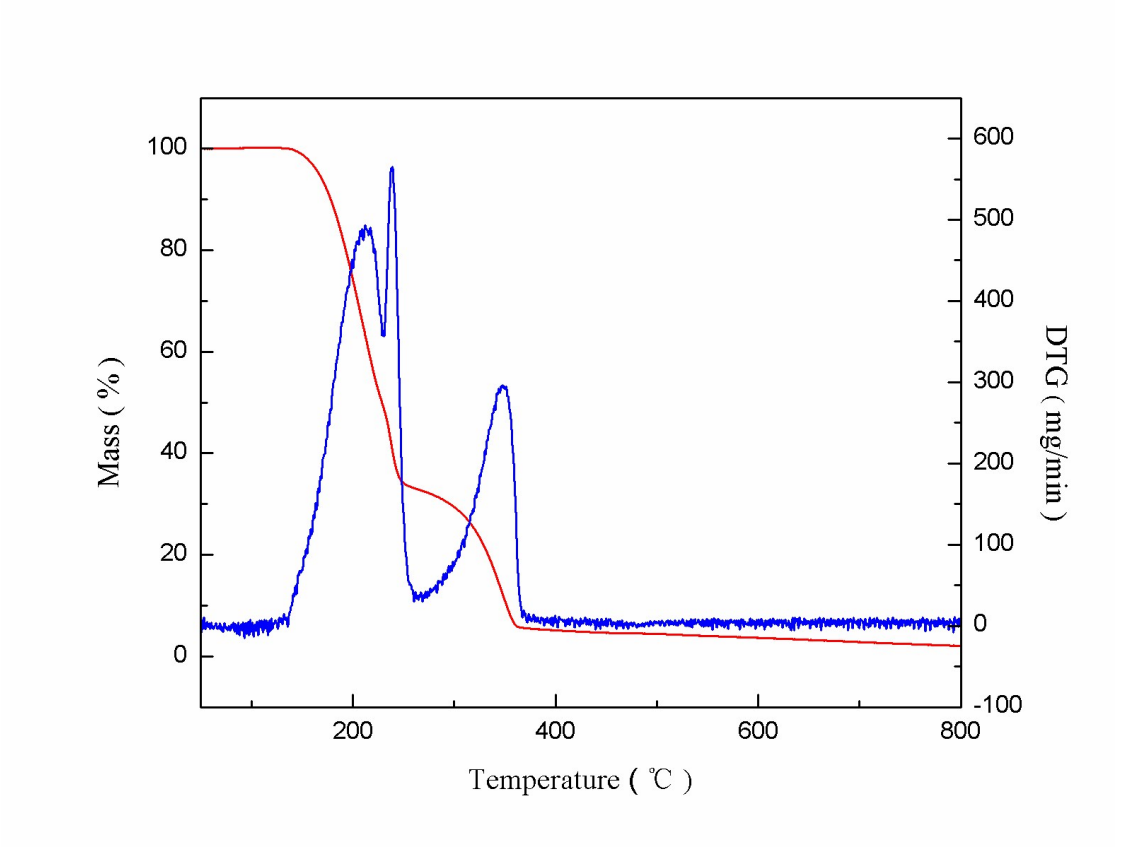

Fig S1 TGA-DTG analysis of the Co_9S_8@N/S-CT composite.

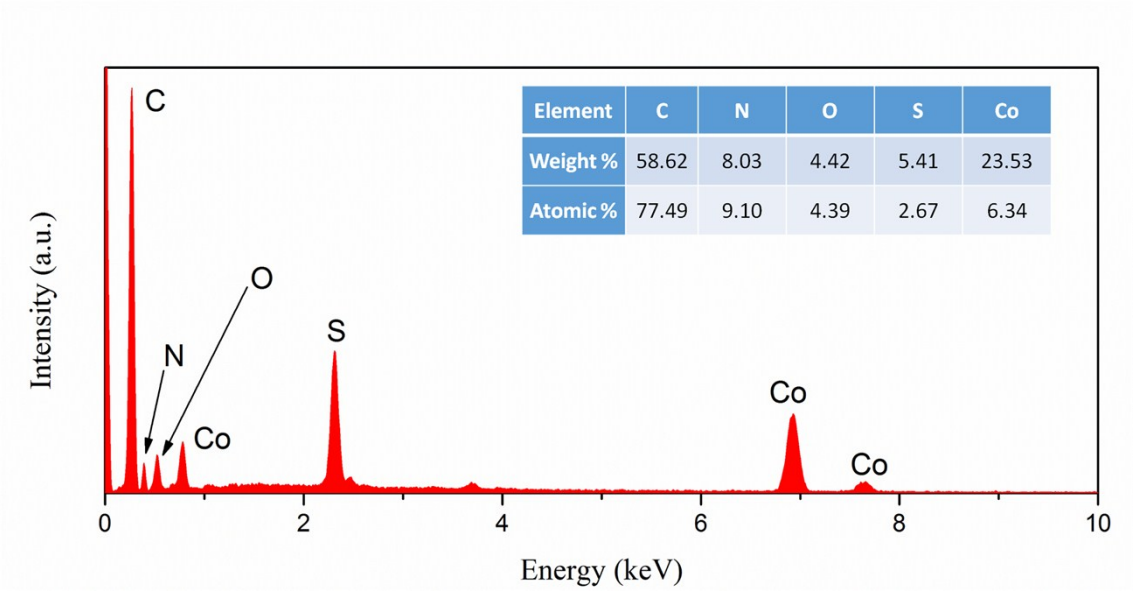

Fig S2 EDS of Co_9S_8@N/S-CT sample

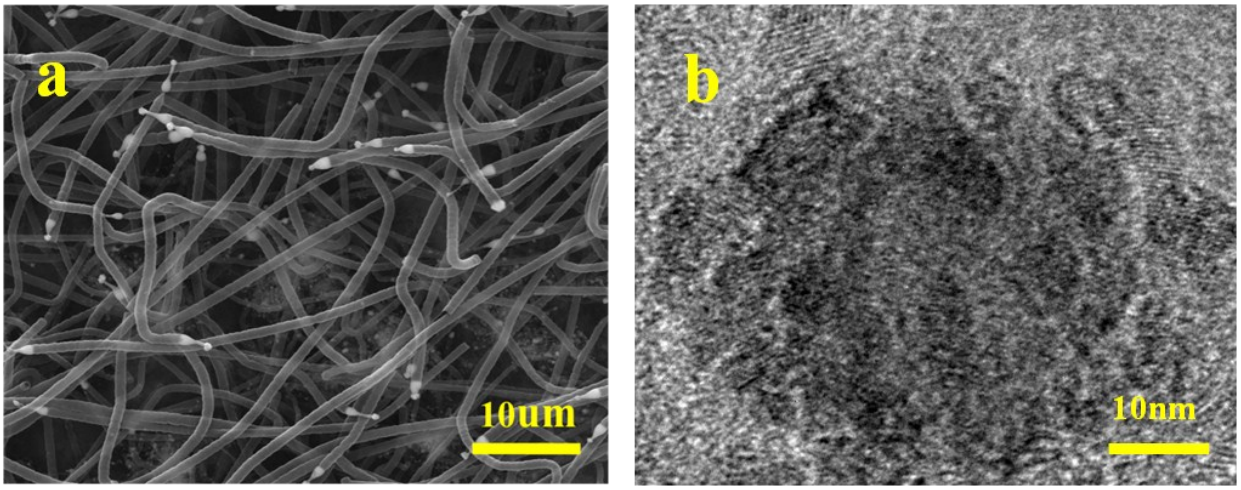

Fig S3 SEM of images of Co_9S_8@N/S-CT bedding in CNFs at the magnifications of 10 um (a) and TEM image of Co_9S_8 nanocrystal.

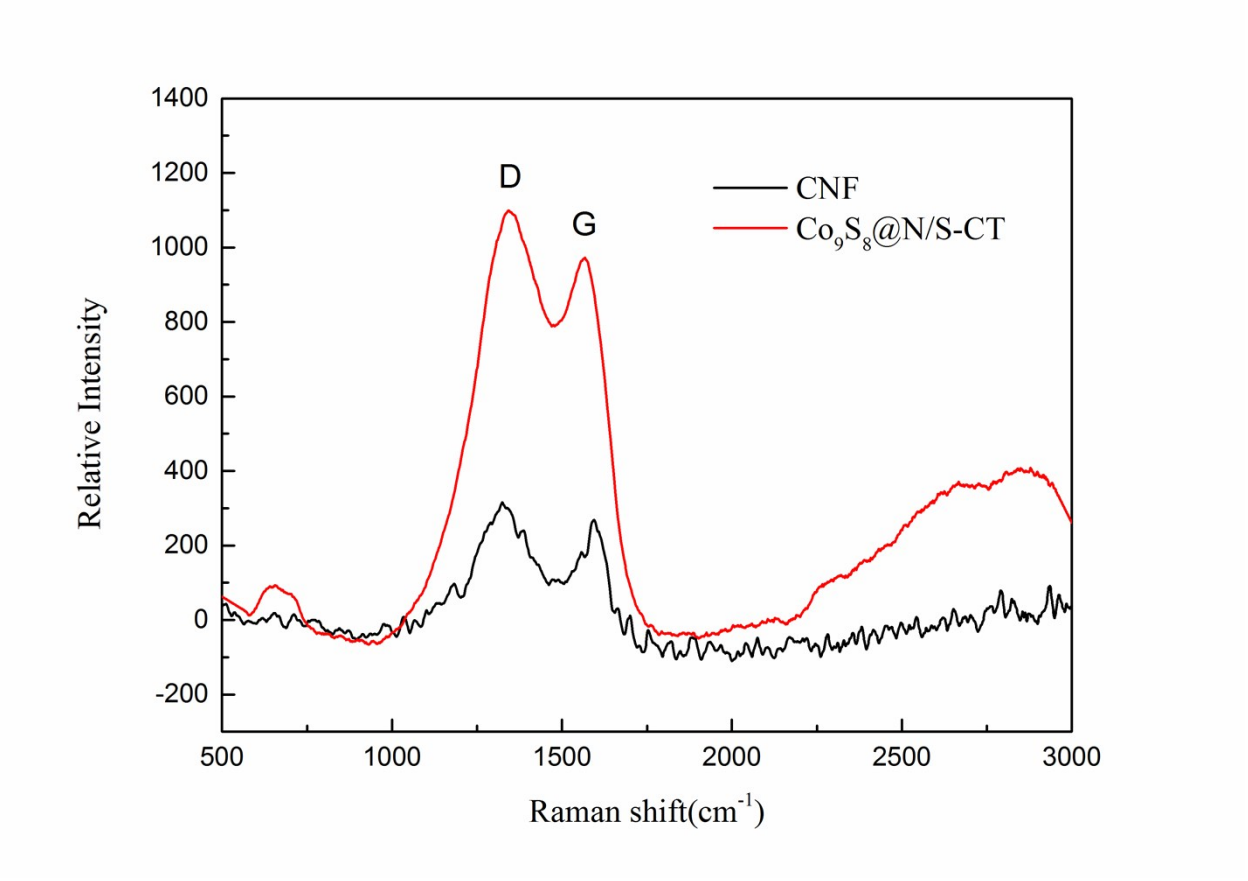

Fig S4 Raman spectra of CNF and Co_9S_8@N/S-CT

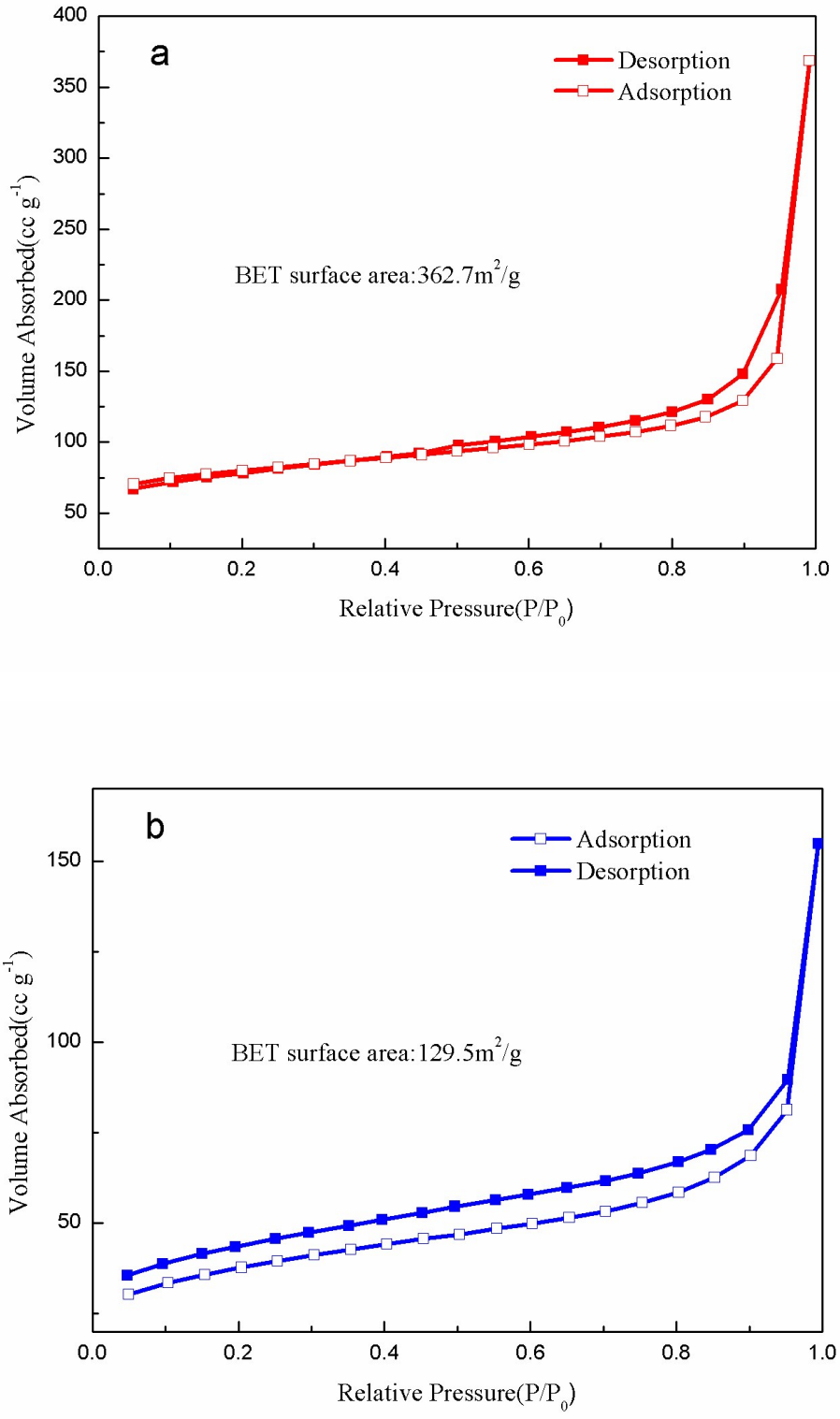

Fig. S5 Nitrogen adsorption /desorption isotherm plots of Co_9S_8@N/S-CT (a) and CNF (b).

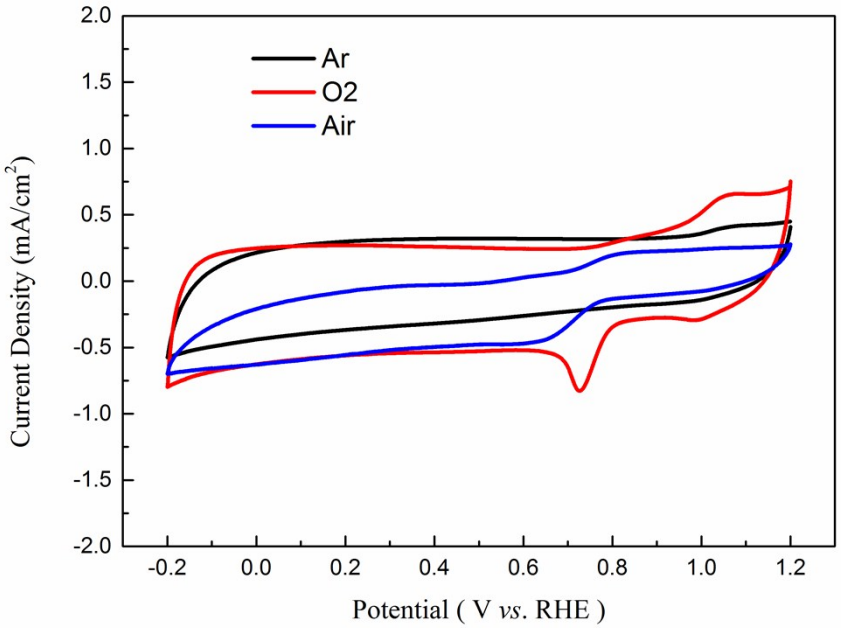

Fig. S6 CVs in N_2–, air– and O_2–saturated 0.1 M KOH with a sweep rate of 50 mVs^{-1} for Co_9S_8@N/S-CT at the stationary electrodes.

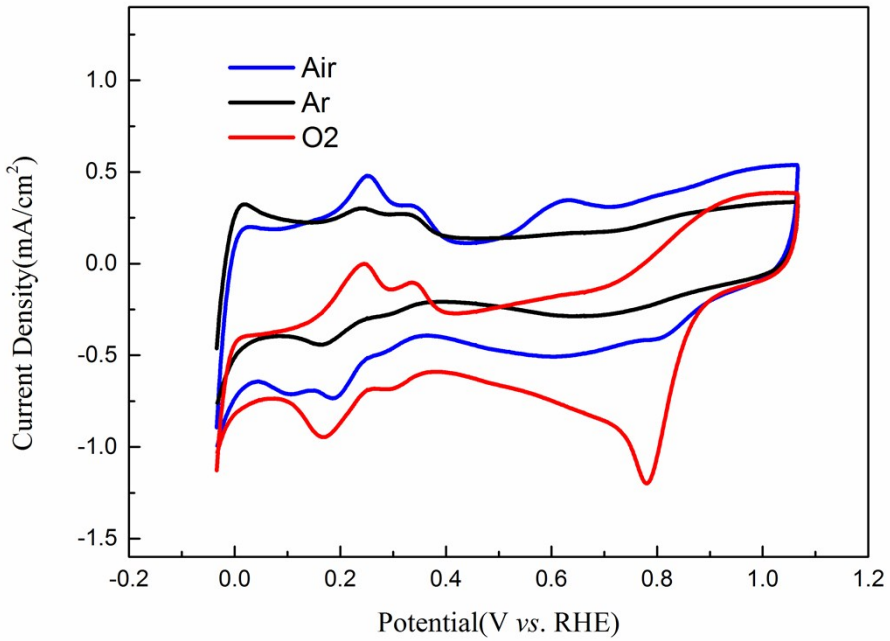

Fig. S7 CVs in N_2–, air– and O_2–saturated 0.1 M KOH with a sweep rate of 50 mVs^{-1} for 20% Pt/C at the stationary electrodes.

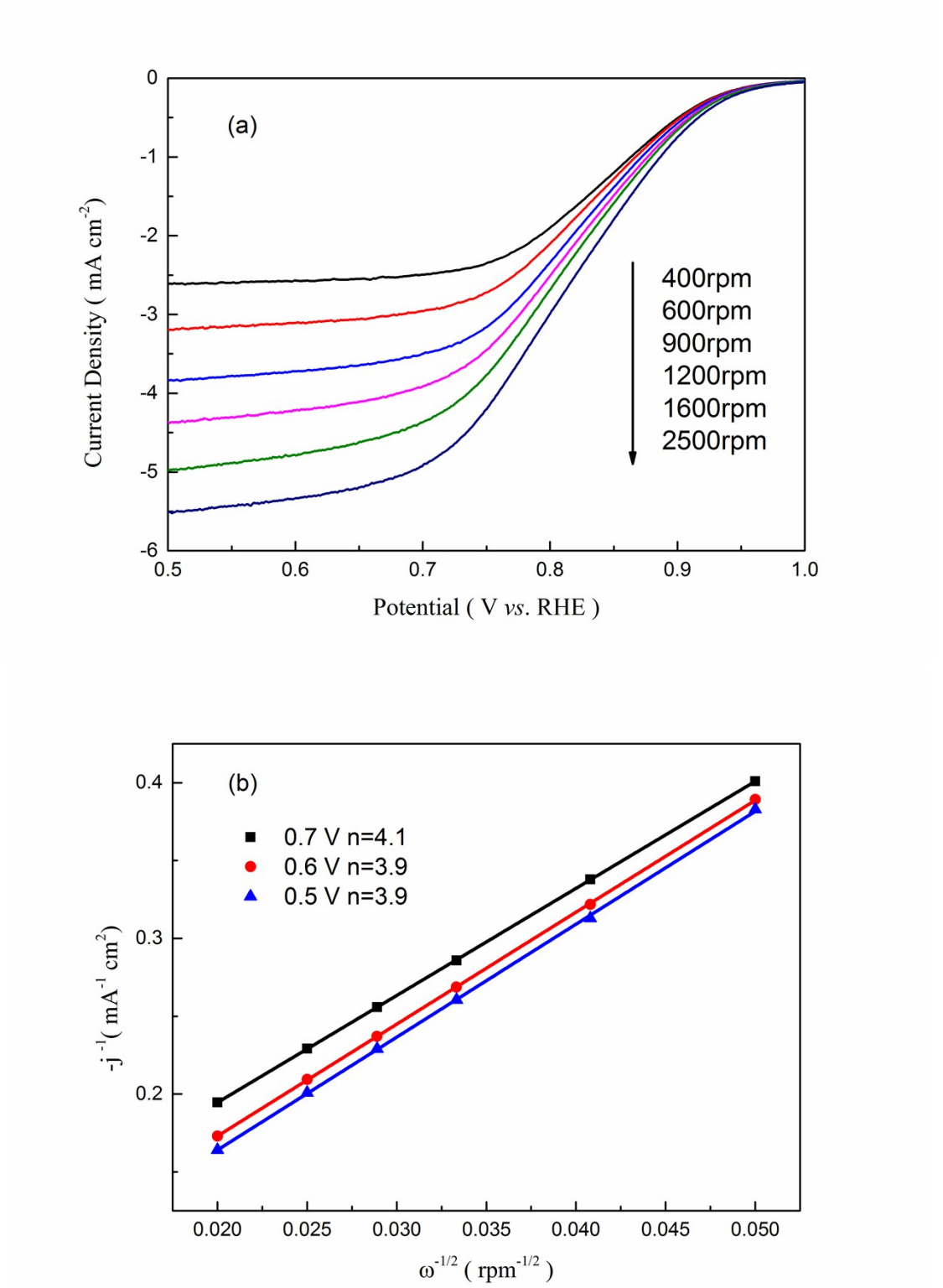

Fig. S8 (a) Polarization curves in O_2-saturated 1.0 M KOH with a sweep rate of 5 mV s^{-1} at different rotating rates of 20% Pt/C. (b) Kouteckye-Levich plots of J^{-1} versus $\omega^{-1/2}$ at different potentials of 20% Pt/C.