

## Three dimension MnO<sub>2</sub>/graphene/carbon nanotubes-based non-noble-metal bifunctional electrocatalyst for oxygen reduction and water oxidation

Daixin Ye<sup>a</sup>, Tong Wu<sup>a</sup>, Hongmei Cao<sup>a</sup>, Yi Wang<sup>a</sup>, Baohong Liu<sup>a</sup>, Song Zhang<sup>a</sup>,  
Jilie Kong<sup>a\*</sup>

<sup>a</sup>Department of Chemistry and Institutes of Biomedical Sciences, Fudan  
University, Shanghai 200433, PR China

### Supplementary Figures

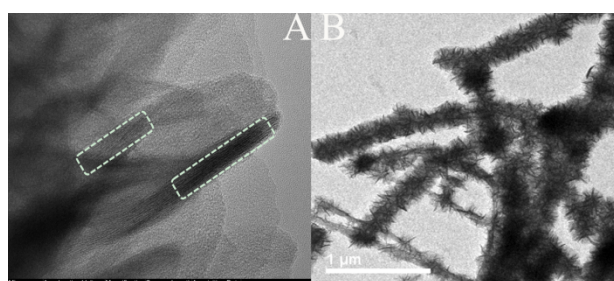


Fig. S1 TEM Images of MnO<sub>2</sub>/G/CNT with different magnification.

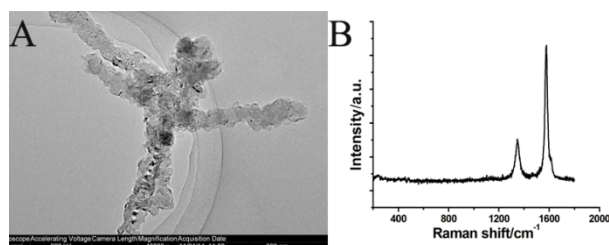
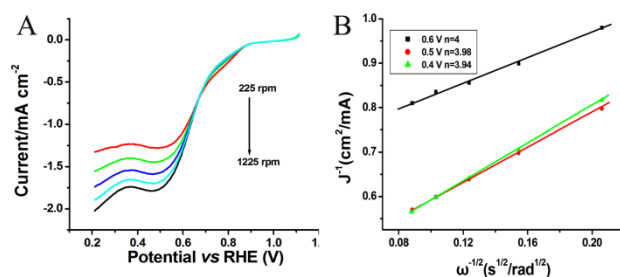


Fig. S2 (A) TEM images of, (B) Raman spectrum of samples after HCl and H<sub>2</sub>O<sub>2</sub> treated.



\* Corresponding author. Address: Department of Chemistry and Institutes of Biomedical Sciences, Fudan University, Shanghai 200433, PR China. Tel.: +86 21 65642138 ; fax: +86 21 65641740  
E-mail address: jlkong@fudan.edu.cn

Fig. S3 (A) LSVs of C/MnO<sub>2</sub> at different rotating rates in 0.1 M KOH solutions saturated with O<sub>2</sub> (B) K-L plots of  $j^{-1}$  vs  $\omega^{1/2}$  obtained from the LSV data at different potentials.

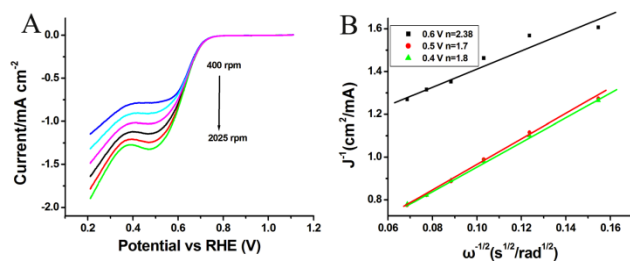


Fig. S4 (A) LSVs of MWCNT at different rotating rates in 0.1 M KOH solutions saturated with O<sub>2</sub> (B) K-L plots of  $j^{-1}$  vs  $\omega^{1/2}$  obtained from the LSV data at different potentials.