Supporting Information

Nitrogen-doped carbon nanotubes synthesized by pyrolysis of nitrogen-rich metal phthalocyanine derivatives for oxygen reduction

Zhanwei Xu, a Hejun Li, a Maosen Fu, b Huijuan Luo, a Huihui Sun, a Lijuan Zhang, a Kezhi Li, a Bingqing Wei, c Jinhua Lu, a and Xueni Zhao a

a C/C Composites Research Center, State Key Laboratory of Solidification Processing, Northwestern Polytechnical University, Xi’an 710072, P.R. China

*Corresponding author. Tel.: +86 29 88495004; fax: +86 29 88492642.

E-mail: lihejun@nwpu.edu.cn.

b Shaanxi Materials Analysis and Research Center, School of Materials Science and Engineering, Northwestern Polytechnical University, Xi’an 710072, P.R. China

c Department of Mechanical Engineering, University of Delaware Newark, DE, 19716, USA
1. The chemical structures of the precursors reported in the literatures

(A) Metal phthalocyanine, (B) 2-amino-4,6-dichloro-triazine, (C) pyrimidine,
(D) dimethylformamide, (E) acetonitrile, (F) melamine, (G) imidazole.

Fig. S1 The chemical structures of the precursors reported in the literatures.
2. XPS analysis of the obtained N-MWCNTs.

Fig. S2 shows the XPS spectra of the N-MWCNTs obtained. It appears that the surface of the samples consists of C and a small number of heteroatoms N, O, Fe, and Ni. S1 consists of 67.43% C, 13.54% N, 15.70% O, 1.73% Fe, and 1.50% Ni respectively. S2 consists of 68.74% C, 12.72% N, 15.13% O, 1.19% Fe, and 2.22% Ni, respectively.

**Fig. S2** The overall XPS spectrum of the obtained N-MWCNTs S1(A) and S2 (B).
3. Thermal analysis data

Fig. S3 TG (black) and DTA (blue) data of the obtained N-MWCNTs S1(A) and S2 (B).

TG and DTA data of the N-MWCNTs obtained show that the initial mass loss of the Sample S1 and S2 are ~7.5% and 8.1% at about 100 °C, indicating the loss of water using as solvent (Fig. S3).