Electronic Supplementary Material (ESI) for Journal of Materials Chemistry
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Supporting Information for: Facile synthesis of MWCNTs/$ZnFe_2O_4$ nanocomposites as anode materials for lithium ion batteries

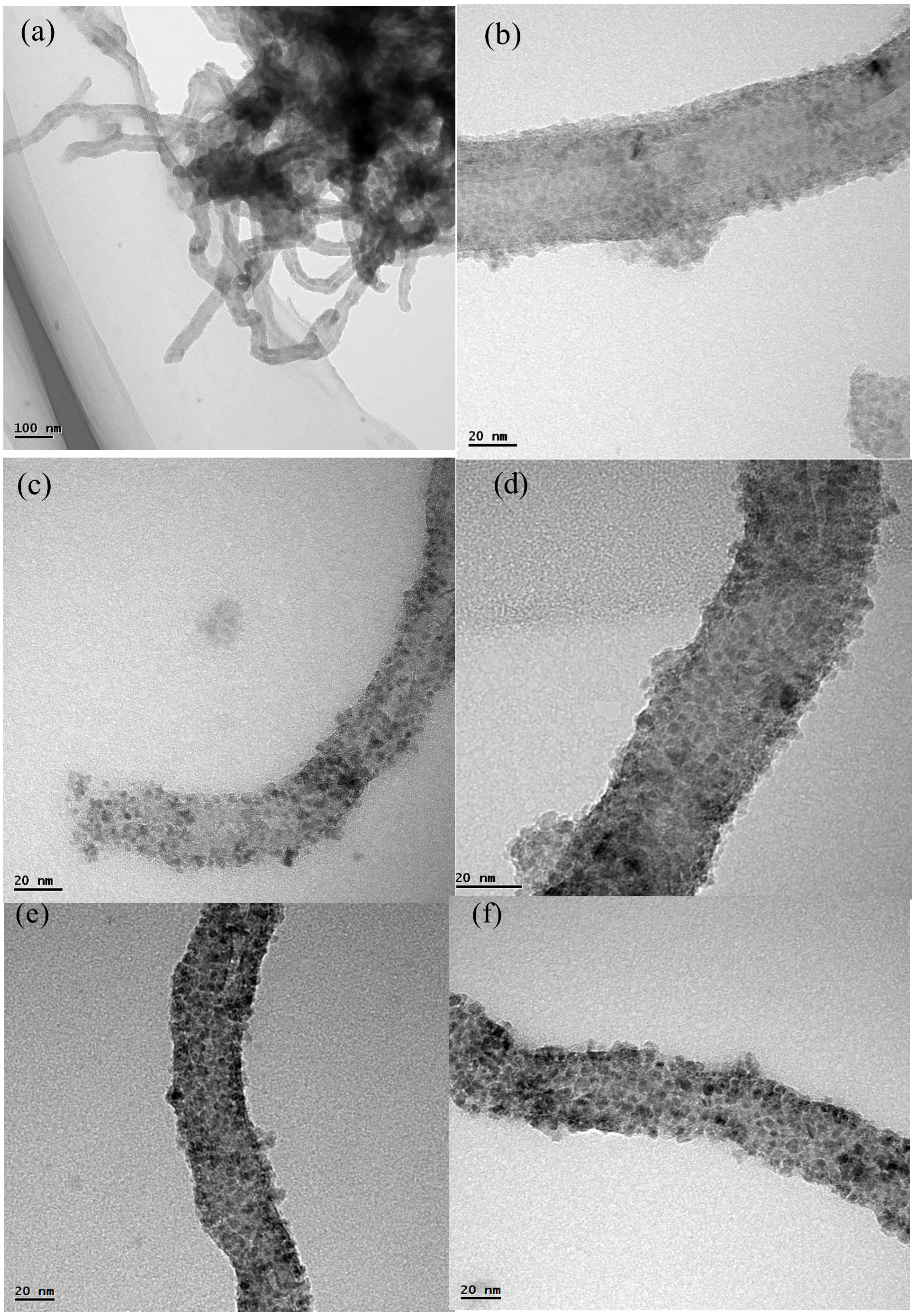

Fig. S1 TEM image of the intermediate products at different temperature (a) 200□, (b) 230□, (c) 240□, (d) 250□, (e) 260□ and (f) 286□ (boiling point)

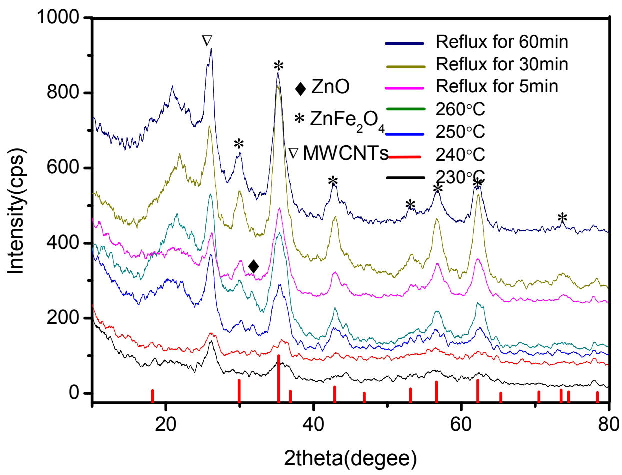

Fig. S2 XRD patterns of the intermediate products at different temperature.

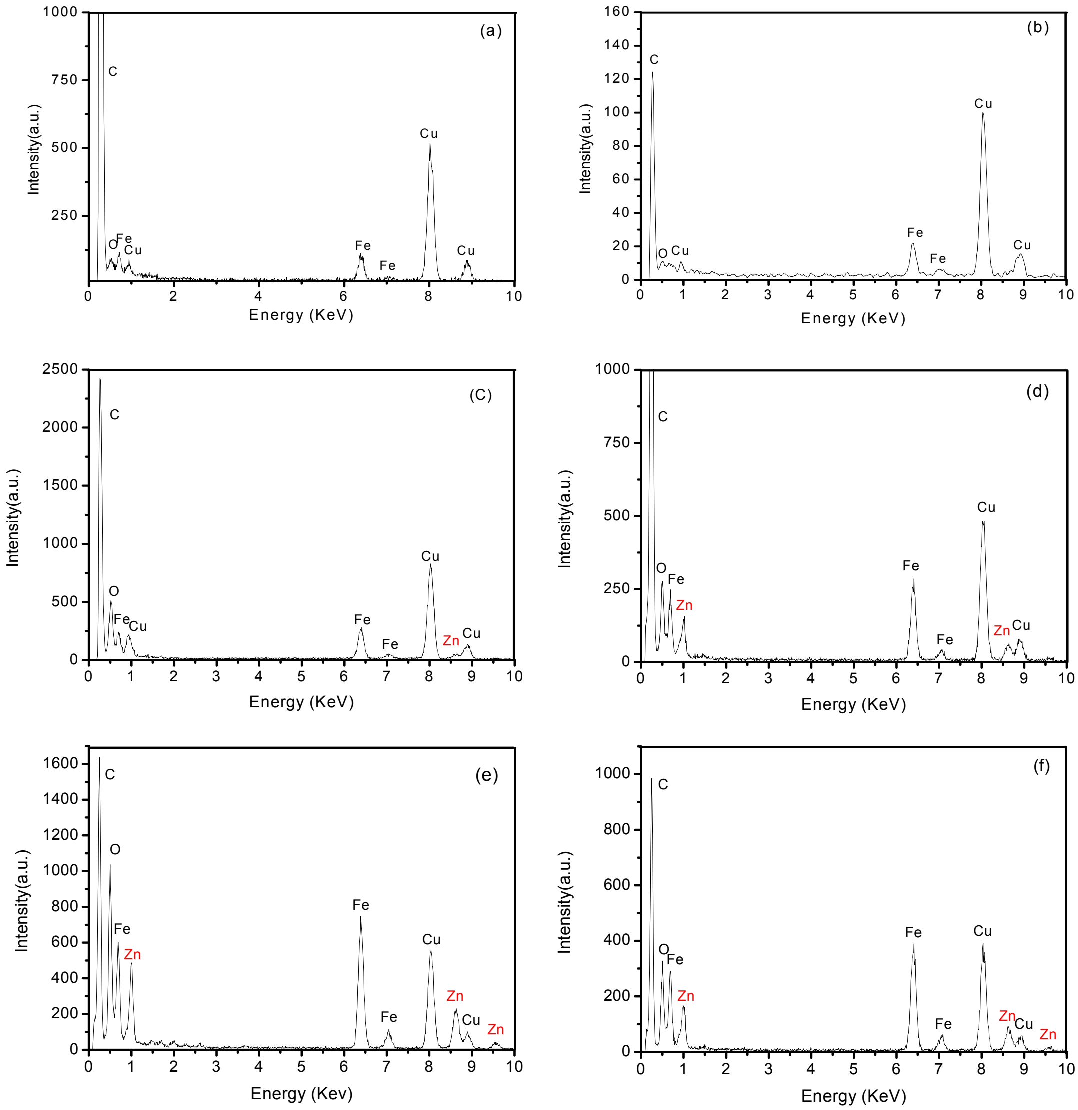

Fig. S3 EDS spectrums of the intermediate products at different temperature (a) 230□, (b) 240□, (c) 250□, (d) 260□, (e) 286□ (boiling point), (f) reflux 30min.

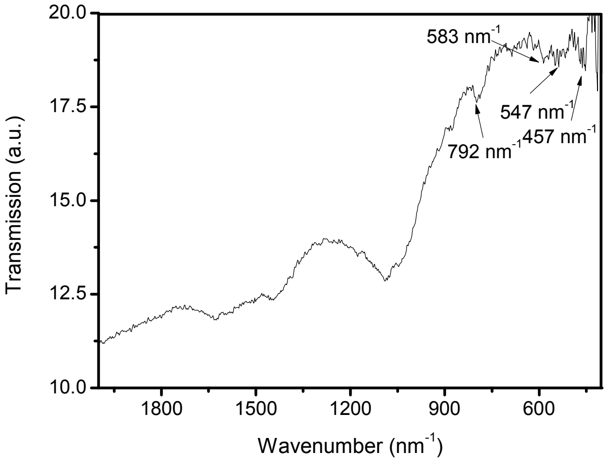

Fig. S4 FT-IR spectrum of the products received in 230-240 □ in the range of 2000 and 400 nm^{-1}. The peaks at 792, 583, 547 and 457 nm^{-1} are attributed to the Fe-O characteristic absorption bands of γ-Fe_2O_3. [1]

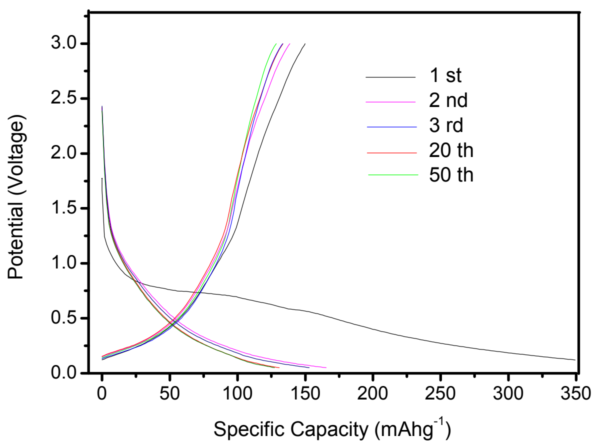

Fig. S5 The discharge/charge profiles of MWCNTs was measured for 50 cycles in the voltage range between 0.05 and 3.0 V at current density of 60 mA/g. The specific capacity of MWCNTs is 130 mAh/g.

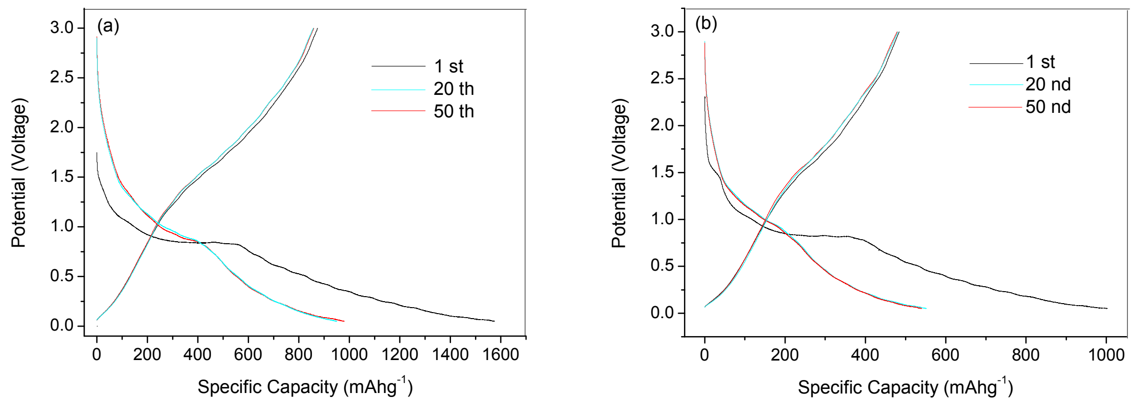

Fig. S6 The discharge/charge profiles of (a) Sample No. 2 and (b) Sample No. 3 obtained under different synthesis conditions as listed in Table 1. The specific capacities for Sample No. 1, 2 and 3 are 1152, 860, and 476 mAh/g after 50 cycles, respectively. It is clear that Sample No. 1, which contains the maximum mass of $ZnFe_2O_4$ nanoparticles in the composites, owns the highest capacity. The capacity contributions of $ZnFe_2O_4$ nanoparticles in the composites are 1032, 730 and 334 mAh/g. Based on the specific capacity of MWCNTs, $ZnFe_2O_4$ nanoparticles contribute 89.6 %, 84.9 % and 70.2 % on capacity of composites. The specific capacities calculated using the total weight of MWCNTs/$ZnFe_2O_4$ nanocomposites are 600, 430 and 228 mAh/g for Sample No. 1, 2 and 3, respectively.

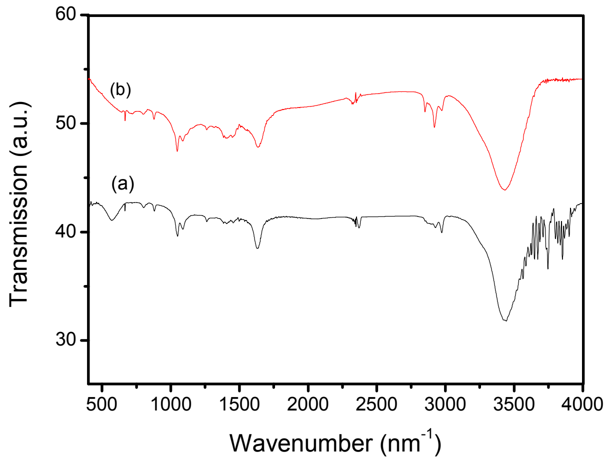

Fig. S7 FT-IR spectra of (a) MWCNTs/$ZnFe_2O_4$ nanoparticles and (b) MWCNTs. The characteristic bands at 2933 nm^{-1} and 2866 nm^{-1} correspond to C-H asymmetric and symmetric stretching vibrations, respectively. The absorption band at 1060 nm^{-1} corresponds to C-O stretching vibration. These three absorption bands confirm the attachment of TREG on the surface of nanocomposites, which makes the nanocomposites well disperse in water and no aggregation.

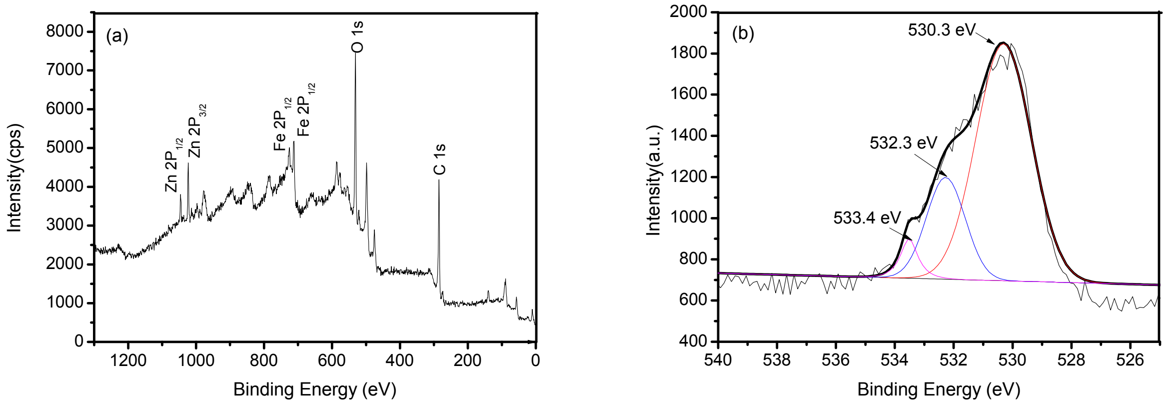

Fig. S8 XPS spectra of the as-synthesized MWCNTs/$ZnFe_2O_4$ nanocomposites (a) survey of the sample (b) O1s high resolution X-ray photoelectron spectra of the MWCNTs/$ZnFe_2O_4$ nanocomposites. Three peaks fitted at 530.3, 532.3 and 533.4 eV could be assigned to metal-oxygen component of the sample, oxygen in an O-H component of surface hydroxyl and oxygen in a C-O component of TREG, respectively.

Reference:

[1] D. Li, W. Y. Teoh, C. Selomulya, R. C. Woodward, P. Munroe and R. Amal, *J. Mater. Chem.,* 2007, **17**, 4881.