Accepted Manuscript

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PII: S0013-4686(18)31968-6

DOI: 10.1016/j.electacta.2018.09.007

Reference: EA 32518

To appear in: *Electrochimica Acta*

Received Date: 10 July 2018

Revised Date: 27 August 2018

Accepted Date: 1 September 2018

Please cite this article as: F. Kong, X. He, Q. Liu, X. Qi, D. Sun, Y. Zheng, R. Wang, Y. Bai, Further surface modification by carbon coating for *in-situ* growth of Fe_3O_4 nanoparticles on MXene Ti_3C_2 multilayers for advanced Li-ion storage, *Electrochimica Acta* (2018), doi: 10.1016/j.electacta.2018.09.007.

Further surface modification by carbon coating for *in-situ* growth of Fe_3O_4 nanoparticles on MXene Ti_3C_2 multilayers for advanced Li-ion storage

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Abstract: Herein, a new nanocomposite was synthesized *via in-situ* growth of Fe_3O_4 nanoparticles on MXene Ti_3C_2 multilayer to improve the electrochemical performance of anodes by integrating the merits of transition metal oxide and Ti_3C_2, where further surface modification of Fe_3O_4@Ti_3C_2 nanocomposites by carbon coating was introduced here. The nanocomposites exhibited excellent electrochemical performance in Li-ion storage when used as the anode materials, which benefited from the combination of the high capacity of magnetite and favorable electrical conductivity of Ti_3C_2. The optimized Fe_3O_4@Ti_3C_2-2.5 (a mass ratio of 1.1) showed a high reversible capacity of 342.9 $mAh \cdot g^{-1}$ at 1C, which exceeded the theoretical capacity of bare Ti_3C_2 monolayer (320 $mAh \cdot g^{-1}$), and an impressive rate reversibility. TEM presented that the carbon layers were homogeneously coated on the surface of nanocomposites with a thickness of approximately 1 nm. The electrochemical measurement showed that C-coated Fe_3O_4@Ti_3C_2-2.5 presented

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