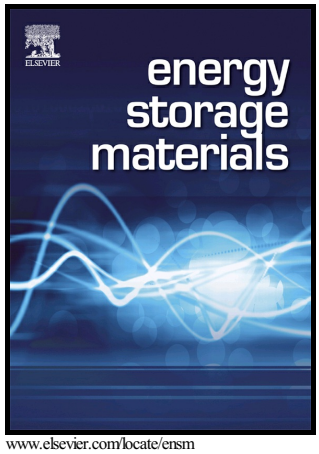

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PII: S2405-8297(18)30517-8
DOI: https://doi.org/10.1016/j.ensm.2018.06.013
Reference: ENSM423

To appear in: *Energy Storage Materials*

Received date: 26 April 2018
Revised date: 5 June 2018
Accepted date: 13 June 2018

Cite this article as: Huangxu Li, Xiaobin Chen, Ting Jin, Weizhai Bao, Zhian Zhang and Lifang Jiao, Robust Graphene Layer Modified $Na_2MnP_2O_7$ as a Durable High-Rate and High Energy Cathode for Na-ion Batteries, *Energy Storage Materials,* https://doi.org/10.1016/j.ensm.2018.06.013

Robust Graphene Layer Modified $Na_2MnP_2O_7$ as a Durable High-Rate and High Energy Cathode for Na-ion Batteries

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Keywords: Sodium-ion batteries; $Na_2MnP_2O_7$; Graphene; Cathodes; Surface modification

Abstract

$Na_2MnP_2O_7$ has been considered as a promising cathode candidate for advanced sodium-ion batteries due to its high potential, low cost and non-toxicity. However, the low initial Coulombic efficiency, poor high-rate and unsatisfactory cycling ability originated from the intrinsic inferior electronic conductivity and manganese dissolution severely hinder its practical application. Herein, we report an approach based on a feasible high energy vibrating activation process to fabricate a robust graphene layers (GL) modified $Na_2MnP_2O_7$ material (noted as NMP@GL) for the first time. The as-prepared NMP@GL could exhibit an ultrahigh initial Coulombic efficiency of 90%, and a high energy density over 300 Wh kg^{-1}. In addition, rate performance and cycling