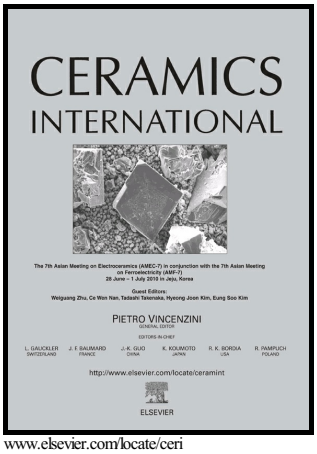

www.elsevier.com/locate/ceri

Synthesis and electrochemical performance of three-dimensional ordered hierarchically porous $Li_4Ti_5O_{12}$ for high performance lithium ion Batteries

Lei Wang, Fen Wang, Jianfeng Zhu, Xin Zhang, Yi Tang, Xing Wang

PII: S0272-8842(17)31741-8
DOI: http://dx.doi.org/10.1016/j.ceramint.2017.08.043
Reference: CERI15997

To appear in: *Ceramics International*

Received date: 22 July 2017
Revised date: 3 August 2017
Accepted date: 5 August 2017

Cite this article as: Lei Wang, Fen Wang, Jianfeng Zhu, Xin Zhang, Yi Tang and Xing Wang, Synthesis and electrochemical performance of three-dimensional ordered hierarchically porous $Li_4Ti_5O_{12}$ for high performance lithium ion Batteries, *Ceramics International,* http://dx.doi.org/10.1016/j.ceramint.2017.08.043

Synthesis and electrochemical performance of three-dimensional ordered hierarchically porous $Li_4Ti_5O_{12}$ for high performance lithium ion Batteries

Lei Wang, Fen Wang *, Jianfeng Zhu *, Xin Zhang, Yi Tang, Xing Wang

School of Materials Science & Engineering, Shaanxi University of Science & Technology, Xi'an 710021, Shaanxi, P.R. China.

Abstract

In this work, a three-dimensional ordered hierarchically porous (3DOHP) $Li_4Ti_5O_{12}$ that possesses inner-particle mesopores resulting from a soft template method and a three-dimensional ordered macroporous (3DOM) $Li_4Ti_5O_{12}$ using polystyrene spheres as a hard template have been synthesized. Both 3DOM $Li_4Ti_5O_{12}$ and 3DOHP $Li_4Ti_5O_{12}$ have ordered macropores and interconnected skeletons with a regular periodicity revealed by SEM and TEM observations. The specific surface area of 3DOHP $Li_4Ti_5O_{12}$ is up to 135 m^2 g^{-1} which is much higher compared with that of 3DOM $Li_4Ti_5O_{12}$ because of the existence of inner-particle mesopores. Attributed to the higher surface area and smaller crystal grain size, more excellent cycle performance and rate capability are obtained for 3DOHP $Li_4Ti_5O_{12}$ compared to 3DOM $Li_4Ti_5O_{12}$. In addition, the hierarchically porous structure of 3DOHP $Li_4Ti_5O_{12}$ can meet rapid insertion and deinsertion of lithium ion even at extremely high rate. It is apparent that 3DOHP $Li_4Ti_5O_{12}$ has a lower total resistance and faster Li^+ diffusion coefficient