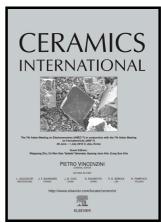
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Synthesis and electrochemical performance of three-dimensional ordered hierarchically porous $\text{Li}_4\text{Ti}_5\text{O}_{12}$ for high performance lithium ion Batteries

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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 m² 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

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