Mesoporous $Li_4Ti_5O_{12}$ nanotubes as an anode material for lithium ion batteries with high rate capabilities and long-term cyclability

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$Li_4Ti_5O_{12}$ (LTO) is expected as the most promising anode materials for lithium ion batteries (LIBs) because of several unique advantages such as zero-strain during charging-discharging, long-term cycling stability, good high-rate performance, and a wide voltage plateau around 1.55 V with enhanced safety. Simultaneously, the LTO has a several disadvantage such as poor electronic and Li ionic conductivities, resulting in low performance at high current rates. To overcome the drawbacks, the preparation of nanotube structures was specifically designed to allow efficient transport of both lithium ions and electrons, which are necessary for a high rate rechargeable battery.

Herein, we report the preparation of LTO nanotubes with mesoporous walls within AAO membranes and their application in a high rate rechargeable lithium battery. Well-aligned LTO nanotube arrays were fabricated via sol-gel method after the dissolution of the membranes. These mesoporous LTO nanotubes, with a 3-dimensional (3D) network structure, were investigated as the electrode material of a rechargeable lithium battery.