Self-organized titania nanotubes for advanced Li-ion microbatteries

Lithium-ion batteries (LIBs) are widely used to power portable devices, microelectronics, vehicles, etc. With many advantages such as high surface area and improved charge transport, self-supported 3-D nanostructured metal oxides such as titania nanotubes (TiO2nts) are promising electrode materials for LIBs and their impact is particularly significant when considering the miniaturization of energy storage systems and the development of 3D microbatteries.

This talk will review the concept and fabrication of all-solid-state Li-ion microbatteries using TiO2nts as negative electrode [1-7]. Effects of material selection and processing on the performance and reliability are presented as a means to develop conceptual guidelines to understand and improve microbattery designs. Fundamentals such as electrode reactions, lithium ion diffusion and the conformal electrodeposition mechanism of polymer electrolytes onto the nanostructured electrodes will be presented. The fabrication of a full 3D microcell showing high electrochemical performance will be presented and the development of the next generation of 3D microbatteries will be discussed.