Researchers propose novel high-performance dual-ion batteries with 3-D porous structure

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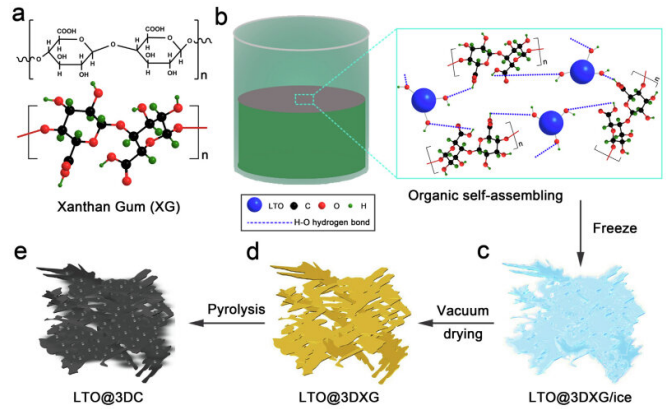

The formation of the LTO@3DC composite. Credit: SIAT

Dual-ion batteries (DIBs) consisting of a graphite anode and cathode have attracted increasing attention due to their advantages of environmental friendliness, excellent cyclic stability and good safety.

Lithium titanate (LTO) has emerged as a promising anode material because of its good rate capability, cyclability, and safety feature.

However, the specific capacity of the lithium titanate (LTO)-DIB is still relatively low ($^{-1}$), which is caused by the mismatching reaction kinetics between the graphite cathode and LTO anode for the low conductivity of LTO.

Researchers from the Shenzhen Institutes of Advanced Technology (SIAT) of the Chinese Academy of Sciences prepared a LTO/carbon composite with in-situ implanted carbon nanofilms and 3-D porous structure (LTO@3DC) by the combination of organic molecule coupling, freeze drying, and pyrolysis.

The study was published in *Chemical Engineering Journal*.

The carbon nanofilms and 3-D porous structure could elevate the electron conductivity and Li+ ions diffusion kinetics, leading to good cycling stability and high rate performance.

Furthermore, researchers constructed DIB configuration by combining the fast kinetics LTO@3DC anode and environmental friendly expanded graphite (EG) cathode (LTO@3DC-DIB). It exhibited enhanced performances with a high specific capacity of 110 mAh g^{-1} at 2 C (1C=100 mA g^{-1}), good rate capability up to 10 C, and long cycling stability with a capacity retention of ~100% after 700 cycles at 5 C.

The LTO@3DC-DIB exhibited a medium discharge voltage of 3 V, much higher than most of reported LTO based full batteries, showing great potential for high safety and environmental friendly energy storage applications.

More information: Ao Yu et al. In-situ implanted carbon nanofilms into lithium titanate with 3D porous structure as fast kinetics anode for high-performance dual-ion battery, *Chemical Engineering Journal* (2020). DOI: 10.1016/j.cej.2020.125834

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