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- Valorising waste PET bottles into Li-ion battery anodes using ionothermal carbonisation

Valorising waste PET bottles into Li-ion battery anodes using ionothermal carbonisation

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Abstract

Waste PET bottles (WPB) is fast becoming an environmental nuisance and its valorization to carbon anode could be a sustainable method to manage this waste and also develop cheap and high-performance carbon materials for Li-ion batteries (LIBs). Carbonaceous materials derived from WPB were prepared using an ionothermal carbonization (ITC) method in choline chloride urea-deep eutectic solvent system. The ITC-derived materials were subsequently annealed in air to obtain carbonaceous materials. The ITC-derived carbon displayed ultra-high nitrogen doping but lesser carbonization and graphitic ordering compared to the reference carbon material obtained using hydrothermal carbonization (HTC). Therefore, higher temperature annealing/pyrolysis was recommended for the ITC-derived carbon. The HTC-derived carbon was investigated as anode material in LIB with promising electrochemical performance. The LIB displayed stable reversible capacity of about 130 mAh/g at a current density of 0.1 A/g after 20 cycles and an increasing Coulombic efficiency that reached 98% after the 50th cycle. This work shows that a facile and sustainable synthesis method could be used to produce PET-derived activated carbons with potential applications in energy storage systems such as LIBs.

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