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Hard Carbon Derived From Dextrose as High-Performance Anode Material for Sodium-Ion Batteries

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Abstract : Hard carbons (HCs) are extensively used as anode materials for sodium-ion batteries due to their availability, low cost, and ease of synthesis. It possesses the ability to store Na ion between stacked sp2 carbon layers and micropores. In this work, hard carbons are synthesized from different concentrations (0.5M to 5M) of dextrose solutions by hydrothermal synthesis followed by high-temperature calcination at 1100 ^{0}C in an inert atmosphere. Dextrose has been chosen as a precursor material as it is a eco-friendly and renewable source. Among all hard carbon derived from different concentrations of dextrose solutions, hard carbon derived from 3M dextrose solution delivers superior electrochemical performance compared to other hard carbons. Hard carbon derived from 3M dextrose solution (Dextrose derived Hard Carbon-3M) provides an initial reversible capacity of 257 mAh g-1 with a capacity retention of 83 % at the end of 100 cycles at 30 mA g-1). The carbons obtained from different dextrose concentration show very similar Cyclic Voltammetry and chargedischarging behavior at a scan rate of 0.05 mV s-1 the Cyclic Voltammetry curve indicate that solvent reduction and the solid electrolyte interface (SEI) formation start at E < 1.2 V (vs Na/Na+). Among all 3M dextrose derived electrode indicate as a promising anode material for Sodium-ion batteries (SIBs).

Keywords : dextrose derived hard carbon, anode, sodium-ion battery, electrochemical performance
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