Hydrothermal Synthesis of Lignin-Based Carbon Microspheres as Anode Material for Lithium-Ion Batteries

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Lignin-based carbon microspheres (LNCS) with regular morphology, good dispersity and uniform particle size were successfully synthesized by hydrothermal method under acidic condition for the first time. LNCS can be prepared by directly carbonization without pre-oxidation. The surface morphology and microcrystalline structure of LNCS was characterized by SEM, TEM and XRD. The structural results show that LNCS possess good sphericity with large interlayer spacing and small graphite-like crystallite size. The electrochemical test results demonstrate that LNCS carbonized at 900°C (LNCS-900) as anode for lithium-ion batteries exhibits the highest specific capacity (180.6 mAh g⁻¹ at 20 mA g⁻¹) and good capacity retention of 98% after 100 cycles. The specific capacity of LNCS-900 recovers from 48.9 mAh g⁻¹ to 171.8 mAh g⁻¹ as the current density decreases from 1 A g⁻¹ to 20 mA g⁻¹, displaying excellent rate performance. Therefore, the as-prepared LNCS is a potential promising and low-cost anode material for lithium-ion batteries.

Keywords: Lignin; Hydrothermal method; Carbon microspheres; Hard carbon; Lithium-ion battery

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