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Nitrogen-doped Graphene Sheets Prepared from Different Graphene-Based Precursors as High Capacity Anode Materials for Lithium-Ion Batteries

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The nitrogen (N) doping in graphene-based materials has been considered as an effective approach to improve the lithium storage performance of lithium-ion batteries. Thus, the studies of the influence of N-doped graphene from different precursors on lithium storage properties are urgently needed. Herein, three different N-doped graphene sheets (N-GT, N-GN, N-RGN) anode materials of LIBs was prepared using the graphite oxides, graphene oxides and reduced graphene oxides as precursors respectively and thermal annealing with melamine. Microstructure tests show the N-RGN possess higher specific surface area (687.7 m^2 g^{-1}), larger interlayer distance and more active sites due to the expanded graphene layers of reduced grapheme oxides than N-GT or N-GN. Electrochemical experiments results show that the order of lithium storage properties is N-RGN > N-GN > N-GT based on specific capacity and cycle performance, which can be explained for specific surface area of material as one of the key structural parameters. Moreover, a high initial reversible capacity of 1250.8 mAh g^{-1} can be achieved for N-RGN at a current density of 100 mA g^{-1}.

Keywords: N-doped graphene; Thermal annealing; Different precursors; Anode materials; Lithium-ion batteries.

FULL TEXT