Carbon cladding boosts graphite-phase carbon nitride for lithium-ion battery negative electrode materials

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Abstract:

In this study, CSs-g-C_3N_4 carbon and nitrogen composites based on glucose carbon spheres were successfully synthesized. High-temperature and high-pressure hydrothermal reaction successfully induces the amidation of glucose with melamine, which led to the synthesis of CSs-g-C_3N_4 carbon and nitrogen composites. A series of characterization tests and electrochemical tests revealed the lithium storage mechanism of CSs-g-C_3N_4 composites. The experimental results show that the CSs-g-C_3N_4 composites exhibit excellent cycling performance in lithium-ion battery anode applications. Specifically, after 300 cycles at a current density of 1 A/g, the material still maintains a lithium storage capacity of 395.2 mAh/g. This data fully demonstrates the superiority and stability of CSs-g-C_3N_4 composites as anode materials for lithium-ion batteries. In addition, the successful preparation of CSs-g-C_3N_4 composites not only demonstrates the technical feasibility of using g-C_3N_4 to prepare carbon and nitrogen composites, but also provides a new idea and direction for the research and development of anode materials for lithium-ion batteries. This achievement is expected to promote the wider application of g-C_3N_4 in the field of energy storage and further enhance the performance of lithium-ion batteries.

Keyword: g-C_3N_4, CSs, Lithium storage capacity, Negative electrode materials, Carbon and nitrogen composites

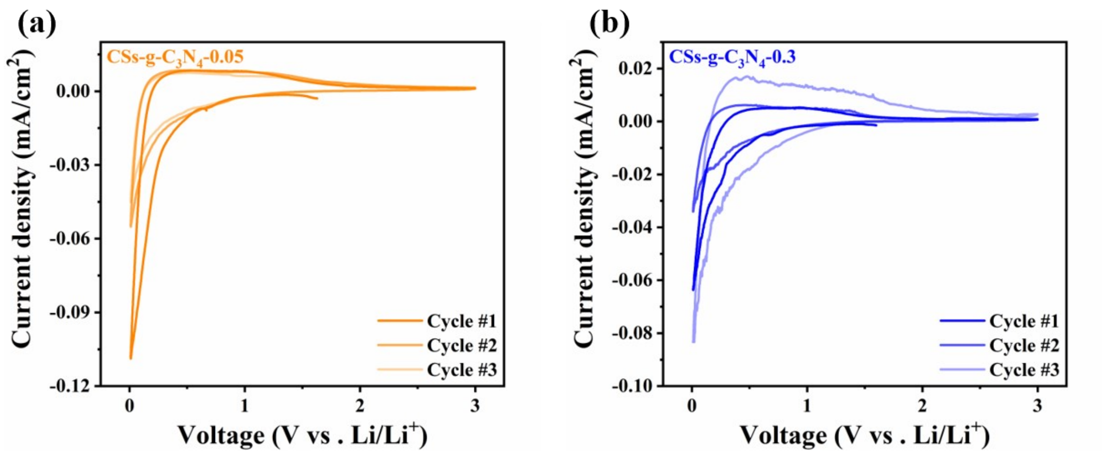

Figure.S1 (a) CV curves of CSs-g-C_3N_4-0.05 composite at 0.1 mV/s sweep rate, (b) CV curves of CSs-g-C_3N_4-0.3 composite at 0.1 mV/s sweep rate

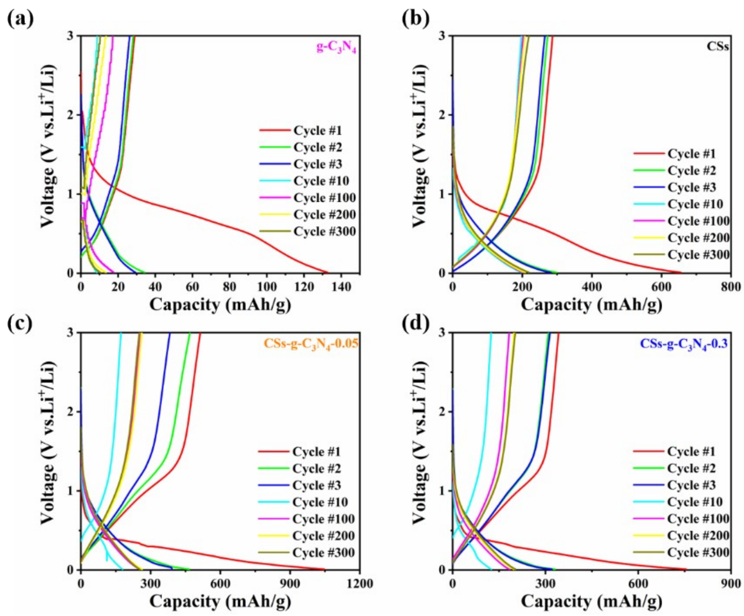

Figure.S2 (a-d) GCD curves of CSs, g-C_3N_4, CSs-g-C_3N_4-0.05 and CSs-g-C_3N_4-0.3 negative materials

Table S1 Content of various nitrogen types in g-C_3N_4 and CSs-g-C_3N_4

Sample	Pyrrole-N	Pyridine-N	Graphitic-N	Oxide-N
g-C_3N_4	17,5%	69.9%	7%	5.6%
CSs-g-C_3N_4	48.5%	31.5%	12.6%	7.4%

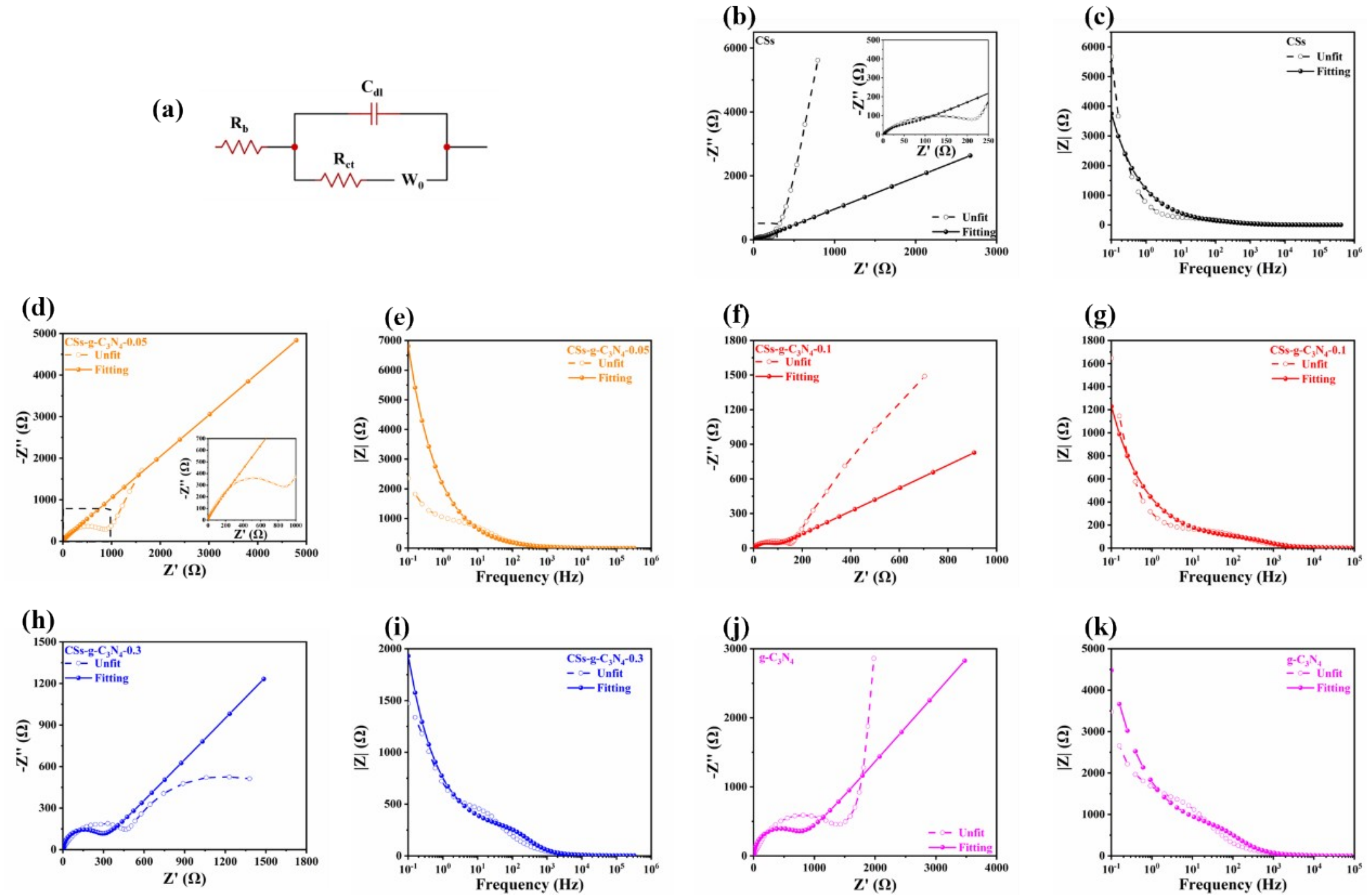

Figure.S3 (a) Equivalent circuit diagrams, (b-k) Nyquist fit and Bode fit for CSs, g-C3N4, CSs-g-C3N4 negative materials

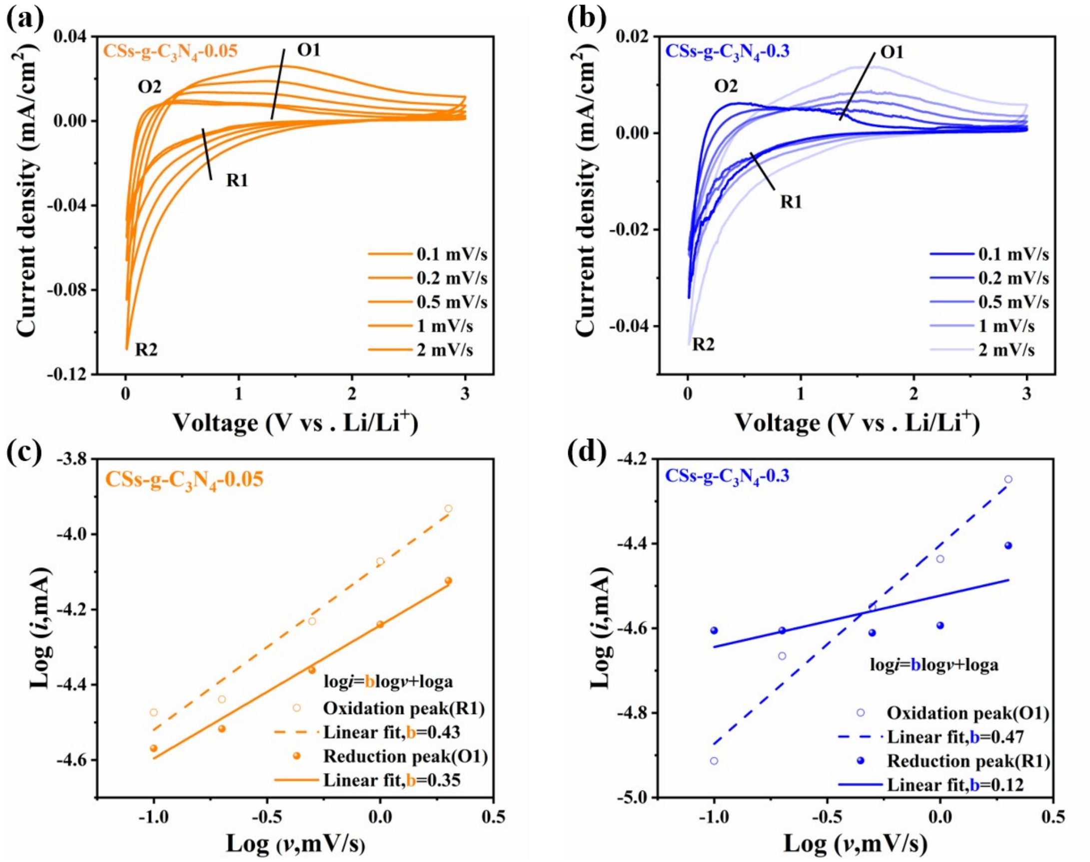

Figure.S4 (a-b) Cyclic voltammetry curves of CSs-g-C_3N_4-0.05and CSs-g-C_3N_4-0.3 composites at different sweep rates, (c-d) fitting analysis of logi and logv correspondences for peaks R1 and O1,