Nitrogen and sulfur co-doped porous carbon based on grapefruit skin for lithium-ion batteries

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Currently, graphite as the anode of the lithium-ion batteries (LIBs) has been widely used in power portable electronic devices. However, the theoretical capacity of graphite (372 mAh g^{-1}) [1] limits the further development of LIBs for large-scale energy storage applications. Carbon materials, especially hard carbon, have been shown to be the most promising anode for LIBs [2]. Biomass-derived carbons, they can usually offer a higher capacity than graphite due to their desirable molecular structure and architectures, which are favorable for charge storage and transport [2]. Herein, we report a one-step pyrolysis, activation and doping synthesis method to convert cheap and easily available grapefruit skin into N, S co-doped porous carbon (NSPC). The results show that the dopant (thiourea, TH) has the dual role of doping and activation, at same time, the discharge capacity of NSPC as the anode in LIBs was 2177 and 1410 mAh g^{-1} at a current density of 0.1 A g^{-1} in the first and second cycles, respectively. The present work has he following advantages: (i) the raw material is cheap and widely available, (ii) the preparation method is very simple, and (iii) the obtained carbons show better performance than graphite in LIBs.

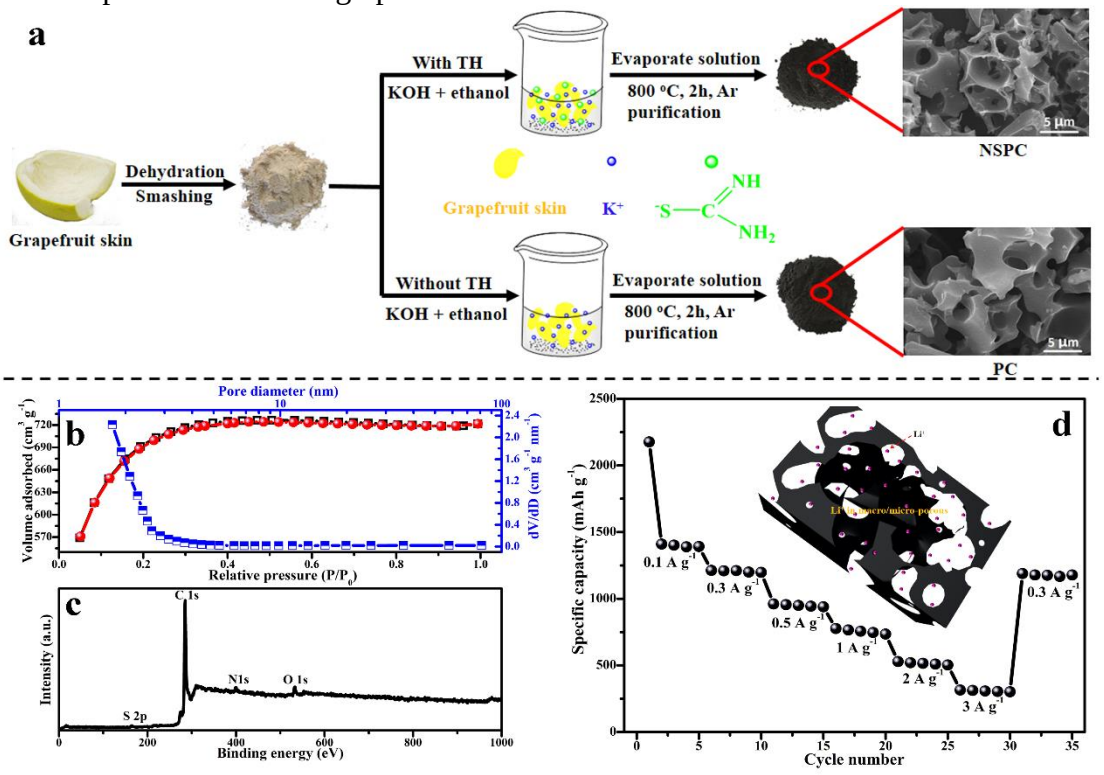

Fig. The preparation process of samples (a); nitrogen adsorption/desorption isotherm (b) and XPS survey spectra (c) of NSPC; specific capacity of NSPC at different current densities (d).

References:

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