Hard and soft carbon materials as negative electrode for potassium-ion batteries

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Potassium-ion batteries (KIBs) received high attention as alternative to lithium-ion batteries, however, finding the suitable anode material for KIBs instead of graphite is a challenge. Hard and soft carbons (labelled HC and SC) attracted a significant attention due to their structure allowing the insertion/extraction of K^+. Herein, we explored HC and SC as well as their corresponding composites. The HC was obtained by pyrolyzing chitosan (C) while the SC by pyrolyzing petroleum and coal tar pitch (P). The structure, texture, and surface chemistry evaluation were done by different techniques. Disordered, ordered and intermediate (ordered/disordered) structures were found for HC, SC, and their composites, respectively. A small specific surface area, active surface area, oxygen functionalities and defects were obtained for all the materials. Electrochemical evaluation of the materials in KIBs showed capacities and stabilities depended on the materials physico-chemical properties.

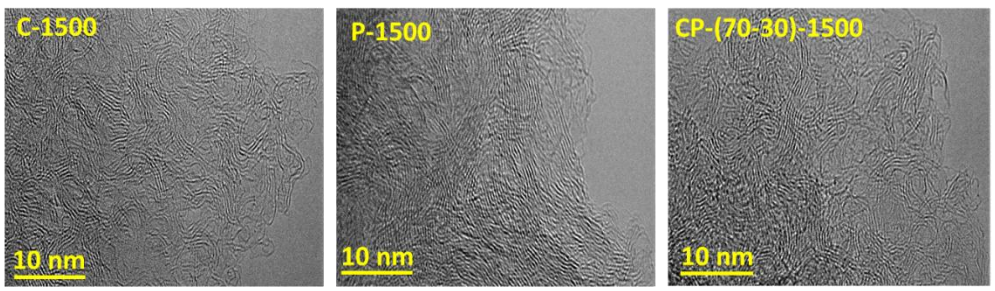

Figure 1. HRTEM images of chitosan-based hard carbon, pitch-based soft carbon and their composites (Hard/soft carbon), respectively.