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Electrochemical characteristics of PFO based pitch prepared by chemical activation for lithium ion battery

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In recent years, carbon-based materials have been extensively investigated as an anode material for Li-Ion Battery (LIB). Because of their low material cost, abundance, nontoxicity and good capacity, carbon materials have been considered promising materials for LIB anodes in portable electronic devices and electric/hybrid vehicles. Despite these advantages, the practical application of carbon-based materials in many electronic device and electric/hybrid vehicles is still limited by its poor electrochemical performances. To enhance these electrochemical performances, we have performed the surface modification of PFO (Pyrolyzed Fuel Oil) based pitch by the chemical activation with KOH. PFO was heat treatment at 420 °C for 3h to prepared the pitch. The preparation method has been optimized through the analysis of diverse experimental variables such as the activating chemical agents to PFO ratio and the molarity of KOH solution. In addition, it shows that chemical activation with KOH solution can be successfully used to develop PFO with appropriate surface area and mean pore size. In this study, the effect of activating chemical agent/PFO weight ratio and Vinylene Carbonate (VC) as an electrolyte additive on electrochemical performances was investigated. The prepared modified PFO was analyzed by BET and FE-SEM. Also the electrochemical performances of modified PFO pitch as the anode were investigated by constant current charge/discharge, cyclic voltammetry and electrochemical impedance tests in the electrolyte of LiPF6 dissolved in organic solvents(EC:DMC=1:1 vol%).The coin cell using modified PFO pitch(KOH/PFO =1:5 in weight) has better initial capacity (420 mAh/g) than that of other composition coin cells. Also, modified PFO anode appeared a high capacity of 330 mAh/g on the second cycle and the retention rate capability of 2C/0.1C was 82% after 30 cycle. It is found that prepared PFO pitch anode showed improved cycling and rate capacity performance.

Biography

Jin Ung Hwang has passion and expertise in designing electrode composites of energy storage system. He pursued various researches on the anode materials of lithium ion secondary batteries, such as silicon and carbon. In this study, surface modification of PFO (Pyrolyzed Fuel Oil) based pitch was performed by the chemical activationmethod, and the physical properties and electrochemical performances of these anode materials were investigated. Theexperiment results were thoroughly analyzed to evaluate the the prepared carbon-based material's feasibility as an anode material for Li-ion battery (LIB).

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