Carbon-mixed $LiFePO_4$ cathode powders prepared by spray pyrolysis

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Lithium iron phosphate ($LiFePO_4$) has been identified as an interesting cathode material for lithium-ion batteries. This material has many advantages of inexpensive, non-toxic and thermally stable in the fully-charged state. In addition, $LiFePO_4$ has a large theoretical capacity of 170 mAh/g and good cycle stability. However, $LiFePO_4$ has poor rate capacity, which is attributed to low electronic conductivity (~10^{-9} Scm^{-1}) and/or slow diffusion rate of lithium ions across the two phase boundary. Recent research has suggested that this limitation of conductivity can be overcome by adding a conductive material on synthesizing the LiFePO4 powder. Spray pyrolysis was applied to the preparation of carbon-included $LiFePO_4$ powders. In this study, the morphologies and electrochemical performances of $LiFePO_4$ cathode powders prepared by spray pyrolysis from aqueous and colloidal spray solutions. The precursor powders obtained by spray pyrolysis from the colloidal spray solution containing nano-sized carbon black had spherical shapes, micron sizes, and filled morphologies. Carbon-mixed $LiFePO_4$ cathode powders improved the charge/discharge capacities and cycle performances.