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INVESTIGATIONS ON LIFEPO4/MWCNTS CATHODE FOR FLEXIBLE LI-ION BATTERIES

Abstract

Olivine structured lithium iron phosphate (LiFePO4) material, firstly reported by Goodenough in 1997, is an attractive cathode material in the field of lithium-ion (Li-ion) batteries because of its salient features compared to other cathode materials. However, the practical application of LiFePO4 is limited by its low electrical conductivity (10-9 Scm-1) and low Li-ion diffusion rate (10-17 cm2s-1). Therefore, tremendous efforts have been made to improve the electrochemical performance of LiFePO4 cathode material through different strategies. Carbon coating is one of the interesting strategy which prevents growth of particles, isolates the particles from each other and also acts as a reducing agent to avoid oxidation of Fe2+ to Fe3+ during synthesis. Free standing and flexible LiFePO4/multi-walled carbon nanotubes (MWCNTs) composite electrodes were prepared using surface-engineered tape-casting method. A maximum electrical conductivity of 1.54 x 103 Scm-1 has been obtained at 75 °C. The electrochemical performance of the LiFePO4/MWCNTs composite electrodes has been analyzed using galvanostatic charge-discharge, cyclic voltammetry and electrochemical impedance spectroscopy. Hydrothermal derived LiFePO4/MWCNTs composite electrode exhibit better capacity (126 mAhg-1 at 0.1 C rate) and electrochemical reversibility. Moreover, after 100 cycles at the rate of 1 C, the specific capacity of around 105 mAhg-1 was observed and its capacity retention rate of 99

Acknowledgment The proposed project is part of the implementation plan for the United Arab Emirates Space Agency's STI Roadmap and it falls under Level 1 STI area of "space power and energy storage" and level 2 "energy storage". The project is aimed at developing enabling technologies for promising mission and system concept; in particular, an in-house prototype of lithium-ion battery. The project can potentially result in a commercially viable lithium-ion battery technology for spacecrafts/satellites.