Fabrication and electrochemical characteristics of electrospun LiNi\(_{0.5}\)Mn\(_{1.5}\)O\(_4\) nanofibers cathode for Li-ion batteries

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Introduction

LiNi\(_{0.5}\)Mn\(_{1.5}\)O\(_4\) has attracted extensive attention due to its good cyclic properties, high working voltage and relatively high capacity\(^{[1, 2]}\). In this work, LiNi\(_{0.5}\)Mn\(_{1.5}\)O\(_4\) nanofibers were fabricated by electrospinning technique.

Experimental

Lithium acetate, manganese acetate, nickel acetate in the stoichiometric ratio were dissolved in deionized water. Then the solution was dropped slowly into ethanol PVP solution with strongly stirring. Thus, the precursor nanofibers were fabricated by electrospinning technique. LiNi\(_{0.5}\)Mn\(_{1.5}\)O\(_4\) nanofiber were obtained by calcining the precursor.

The cathode electrode was prepared by using a mixture of LiNi\(_{0.5}\)Mn\(_{1.5}\)O\(_4\), super carbon and PVDF at the weight ratio of 75:15:10 with the help of 1-methyl-2-pyrrolidone and pressing on an aluminum foil. Metallic lithium was used as anode. The electrolyte solution was 1M LiPF\(_6\)/EC+DEC. Charge-discharge characteristic was evaluated on Land cell tester with CR2032 coin-type cell at 0.5C.

Results and Discussion

Fig.1 shows the morphology of LiNi\(_{0.5}\)Mn\(_{1.5}\)O\(_4\) nanofibers. The diameter of nanofibers is about 200 nm, and the length can reach as long as dozens of micrometers. Fig.2 shows the discharge capacities and cyclic stability at 0.5C of LiNi\(_{0.5}\)Mn\(_{1.5}\)O\(_4\). After cycling 100 times at room temperature, the discharge capacity is still more than 116 mAh/g, and retains 93.5% initial capacity at 100\(^{th}\) cycle.

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