THE CONDUCTIVITY OF Li_2FeO_2 AND Li_3FeO_3

MOHD ADIB BIN ABDUL HAMID

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ABSTRACT

THE CONDUCTIVITY OF Li_2FeO_2 AND Li_3FeO_3

The development of portable equipment such as personal computers, mobile phones, and others has an increasing in demand for battery power sources. Lithium batteries have been investigated as batteries which have high energy density. There is an invention involving lithium-iron-oxide as an electrode active material. It exhibited good cyclability delivering about 12mAh/g after 500 deep charge/ discharge cycle. Lithium iron oxide having a tunnel structure that can cause electrochemical intercalation and deintercalation of lithium ion in any lithium conductive electrolyte. Purity of the material is determined by using X-ray powder diffraction pattern. The conductivity testing was run using WEIS510 impedance spectroscopy. The resistivity result from the impedance spectroscopy is vary in temperature from 60 ^{0}C to 100 ^{0}C. It is found that Li_3FeO_3 is more conductive than Li_2FeO_2. Li_3FeO_3 is more conductive than Li_2FeO_2 due to extra ions carrier. The conductivity of Li_3FeO_3 is the movement of $3Li^+$ and $[FeO_3]^-$ ions and Li_2FeO_2 is the movement of $2Li^+$ and $[FeO_2]^-$ ions. Ionic exchange between cation and anion will determine the conductivity rate of the materials. Both materials are showing good conducting behaviour above 100^{0}C and beyond.

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

The development of portable equipment such as personal computers, mobile phones, and etc. has an increasing in demand for battery power sources. In particular, lithium batteries have been investigated vigorously as a battery that can ensure a high energy density [8]. This is because lithium has small atomic weight and can give high ionization energy. The present invention relates to lithium batteries including lithium-iron-oxide as an electrode active material.

As the positive electrode active materials used for these lithium batteries, those that can generate a voltage of as high as 4 V; li_xCoO_2 or li_xNiO_2, have been actively studied recently, in an attempt to increase the electromotive force and energy density of batteries [10]. However, cobalt (Co) and nickel (Ni) compounds are costly and their outputs are relatively small hence they are not optimal materials for practical batteries. Therefore Co or Ni should be substitute with aforementioned compounds of other transition metal elements, particularly iron (Fe) compounds which is has low cost and rich outputs [10].