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ELECTRICAL PERFORMANCES OF LITHIUM-ION COIN CELL BASED ON REDUCED GRAPHENE OXIDE (RGO)

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Abstract— **Recently many portable devices need electrical energy which instant and high capacity. Lithium-ion battery is one of very popular as mobile electrical energy source for them. This study focused to elaborate the electrical performances of reduced graphene. They were electrical conductivity, cycle performance of charge-discharge, and specific capacity. Doctor blade technique was used to produce the anode. Vacuum technique was used to assembly Lithium-Ion Coin Cell. Electrochemical Impedance Spectroscopy and Cyclic Voltammetry were used to measure the electrical performances of coin cell. The results showed that electrical conductivity value was 8×10^{-5} S/cm, and the specific capacity value was 400 mAHr/g. So, this study has shown a prospective application in the future to produced commercially lithium-ion coin cells.**

Keywords—Reduced Graphene Oxide (rGO), Anode, Lithium-Ion Coin Cell, and Doctor Blade Technique

I. INTRODUCTION

Recently many devices need mobile electrical energy sources for supporting and help our life easily. They are calculator, mobile phone, smart watch, digital camera, laptop, and immediately electric vehicles and hybrid vehicles. The main problem is to get electrical energy sources which properties high energy density, higher output power, fast charging, support green environmental principle, small and lightweight in size, and durable [1]. For this reason, Lithium Ion Battery (LIB) is the promising electrical energy sources for suppoting mobile compact energy.

One of the important prototype of LIB is coin cell. It can be assembled from reduced Graphene Oxide/Copper (rGO/Cu) anode, lithium foil cathode, polypropylene separator, and PF_6 electrolyte [2]. They have many advantages to develop Lithium-Ion (LI)-Coin Cell because it has good conductivity, higher energy capacity, easy and cheaper in fabricating, and durable.

Various popular methods are used to prepare battery anode, i.e. solid state method, hydrothermal route, solvothermal process, electrospinning deposition, microwave-hydrothermal method, and sol gel method have been proposed by many researchers [3-7]. In this work solvothermal route was used to prepare slury material for anode. Doctor blade technique and solid state rection method were employed to prepare rGO/Cu composite. Moreover, the effect of rGO to the electrical performances of LI-Coin Cell are also carefully investigated.

II. EXPERIMENTAL AND MEASUREMENTS

LI-Coin Cell formation contained three stages, i.e. preparation of components, assembly process, and measurement of electrical performance. For detailing each stage is explained as follows.

A. Preparation Components LI-Coin Cell

Main Components of LI-Coin consist of anode, cathode, separator, electrolyte, and coin jacket. Anode rGO/Cu was prepared through three stages, i.e. formation of: (1) rGO powder, (2) slurry, and (3) anode composite. It was prepared from coconut shell using the special treatment [8]. Slurry was prepared from rGO powder, polyvinylidene difluoride (PVDF), and acetylene black (AB) with percentage ratio 85:10:5. They were dissolved and Stirred (100 rpm and 80^{o}C) in N,N-Dimethylacetamide (N,N-DMAC). The slurry was superimposed to copper foil using doctor blade equipment