LITHIUM BATTERIES

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Abstract

The materials based on lithium - cobalt oxides were prepared by low-temperature deposition. The number of portable computational and communicational devices increases rapidly in the multimedia age, and the need for miniaturised energy sources becomes a necessity. An ideal battery should be inexpensive, compact, lightweight, and infinitely rechargeable. For general consumer use it has to fulfil safety and reliability standards. In this point the development of Li batteries has not met the requirements of the market and safety yet.

Introduction

Today's market, more than before, request such power supply, that would answer very exacting and sometimes antagonistic requirements (output versus size, service life and reliability versus price etc.).

Early eightieths years there was more intensive interest in more efficient current power supply with a long life and a low percentage self-discharge, that are determination for use in microelectronics, medicine, military and other region. With it relates searching a new type galvanic primary and secondary cell. For area microelectronics be to seek cells with a long service life during a small output. This requirements nowadays the best fulfil lithium or lithium – cobalt batteries.

These very efficient electrochemical current source with in comparison with common conventional source, for example Leclanche or alkaline, define double voltage (3-3.4 V), multiple higher specific energy (till 500 $Wh.kg^{-1}$), flat discharge curve, a long service life at stocking (10 years) and it all also at extreme temperatures. One of the major features of lithium battery is also low ratio self-discharge, under 1 % yearly. That is why lithium cells are already producing in million amounts yearly.

For majority applications be to seek, so that cells offer resistance shocks, reliably work in the range of common outside temperature in haphazard position and do not lose yours capacity. These are the main reasons why the liquid electrolytes are replaced by gel polymer electrolytes, which thanks its viscosity better correspond with this exacting requirements.

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Analysis

Composition of electrodes

In practical parts of my work I investigated composition of positive electrodes for lithium cells. These electrodes are realised by striking due masses, that has to be totally exsiccation on nickel-coated net. The materials kept up piles due to PTFE emulsion. Further the net with drifted material is pressed. Material extracts on net by this way are dry, because using Teflon emulsion for better joinder material nesting contains waters. This way made electrodes with by various conditions components I measured on computer-controlled potentiostat (Eco Chemie Autolab) and analysed optimum composition for positive electrode of lithium cell. Appreciation consists in comparison available energy and capacities from explored electrodes. This work is connected on already aged research in the area of lithium batteries, which is transactioned on our institute. Materials used for spot sample are presented in Table 1.

Tab. 1 *Composition of positive electrode (negative electrode is made of metal lithium, supporting electrolyte 0.5M lithium perchlorate in propylene carbonate)*

Sample	$LiCoO_2$ [wt. %]	Carbon black [wt. %]	Graphite CR5 [wt. %]
1	20	50	30
2	50	20	30
3	80	15	5

Comparison of measurement and work out data values

These samples for positive electrodes were investigated by cyclic voltammetry (discharge and repeatedly charging these articles) on computer-controlled potentiostat Autolab. Samples were investigated in voltage range from 1.8 V till 4 V. Values of usable capacities and energy for spot sample was obtained by reckonings that are summary with the following table.

Tab. 2 *Comparison of obtained capacity and energy*

Sample	Obtained capacity [%]	Obtained energy [$Wh.kg^{-1}$]
1	24.51	125
2	6.02	25
3	4.02	20

Discussion

The biggest available capacity was obtained from sample 1 with 20 wt. % of $LiCoO_2$ and the value is 21.51%. The best energy efficiency shows again sample 1 with 20 wt. % $LiCoO_2$ and the value is 125 $Wh.kg^{-1}$.The best parameters for practical use has sample 1,

since provides the best capacity and offers the biggest output power of all surveyed samples.

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