NEGATIVE ELECTRODES FOR LITHIUM BATTERIES

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Introduction

The materials based on ammonium hydrogen carbonate (NH4HCO3) were prepared by low-temperature deposition. The number of portable computational and communicational devices increases rapidly in the multimedia age, and the need for miniature energy sources becomes a necessity. An ideal battery should be inexpensive, compact, lightweight, and infinitely rechargeable. For general consumer use it has to fulfill safety and reliability standards. In this point the development of Li batteries has not met the requirements of the market and safety yet.

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

In early eighties there was more intensive interest in more efficient power supply with a long life and a low self-discharge, that are determining use in microelectronics, medicine, military and other regions. Therefore the search for new types of galvanic primary and secondary cells became necessary. For the area of microelectronics for example, the goal would be cells with a long service life of a cell giving small output.

These very efficient electrochemical power sources in comparison with common conventional cells (for example Leclanché or alkaline, cells) are characterized by much higher voltage (3 - 3.4 V), higher specific energy (up tol 500 Wh/kg), flat discharge curve, a long service life and shelf life (10 years) and an extended temperature range.. One of the major feature of lithium batteries is also low self-discharge, under 1 % yearly. That is why lithium cells are already produced in million series yearly.
For majority applications the cells should offer resistance shocks, reliable work in the range of common outside temperature and in any position and without loss of the capacity. These are the main reasons why the liquid electrolytes are replaced by the gel polymer electrolytes.

Experimental

Preparation of electrodes

The carbon based electrode materials for negative electrodes were prepared using PTFE as a binder and deposited by pressing on nickel net. Then the materials were dried

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carefully. Ammonium hydrogen carbonate was added to the material with the aim of obtaining a macroscopically porous structure. This compound was finally decomposed by heating of the electrode.

Measurement Procedure

The electrodes were tested by a fully computerized potentiostat AUTOLAB and its procedure for cyclic voltammetry. The evaluation was performed using its software by integration of the peaks and under the assumption that the theoretical composition would reach the formula LiC_6.

Results

Three samples of negative electrodes were investigated by cyclic voltametry in voltage span from 0.5 V to 2.5 V. Values of OBTAINED capacities are summarized in the following table 1.

Table 1 *Composition and capacity of the electrodes*

Sample	NH_4HCO_3 (wt. %)	PTFE (wt. %)	Carbon black Chezacarb A (wt. %)	Carbon black Chezacarb B (wt. %)	Expanded Graphite (wt. %)	Obtained capacity (%)
1	25	5	**70**	0	0	**53**
2	25	5	0	**70**	0	**84**
3	25	5	0	0	**70**	**8**

Conclusion

The highest available capacity was obtained using the sample No. 2 with 70 % amount of carbon black Chezacarb B and it reaches 84 % of theoretical value. On contrary, the expanded graphite does not seem as efficient.

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