

GOVERNMENT OF INDIA : THE PATENT OFFICE, 214, LOWER CIRCULAR ROAD, CALCUTTA-17.

Specification No. 103972. Application No. 103972, dated 21st February 1966. Complete Specification left on 19th November, 1966. (Application accepted 21st September, 1967.)

Index at acceptance—14A2[LVIII(1)].

IMPROVEMENTS IN OR RELATING TO THE FABRICATION OF NEGATIVE ELECTRODE IN SILVER OXIDE-ZINC CELLS.

PROVISIONAL SPECIFICATION.

COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH, RAJ MARG, NEW DELHI 1, INDIA, AN INDIAN REGISTERED BODY INCORPORATED UNDER THE REGISTRATION OF SOCIETIES ACT (ACT XXI OF 1860).

This is an invention by DR. PREM BEHARI MATHUR and NALLA GOUNDAR KARUPPANNAN, both of Central Electrochemical Research Institute, Karaikudi-3, S. Rly, India are Indian citizens.

The following specification describes the nature of this invention.

This invention relates to the improvements in or relating to the fabrication of the zinc oxide negative electrode used in silver oxide zinc secondary cells.

Hitherto it has been the common practice to use zinc mesh or a plate as a support for the active material zinc oxide in negative electrode in silver oxide zinc cells. The metallic base in individual electrodes subscribe additional weight to the battery and also does not permit the performance of the cells at the very high rates of charge and discharge owing to the passivation of zinc base surface at high current densities and at ordinary and sub-zero temperatures. The cells thus deliver lower power output per unit volume, the lowering in power being proportional to the volume occupied by the supporting metallic base.

The object of this invention is (a) to obviate these disadvantages by avoiding the zinc mesh or perforated sheets or any other type of zinc metal support and (b) to improve the ampere hour capacity per unit weight of the cells by thus introducing larger quantities of active materials within the spare volume made available in the absence of supporting base in negative electrode. The performance of zinc cathode has further been improved by introducing in it certain additional agents. To these ends, the invention broadly consists in (a) the reduction in the weight and volume of the negative electrode with reference to the ampere hour capacity

of the electrode, (b) improvements in the charge and discharge capabilities of zinc oxide electrode at high current rates, (c) improvements in the overall ampere hour capacity per unit weight and volume of the cell by incorporating additional quantities of active materials within the specified volume of a cell, in lieu of supporting grid in the negative electrodes, and (d) improvements in low temperature performance of the cells by avoiding factors leading to the passivation of negative electrode at sub-zero temperatures.

Noteworthy features :

1. A process for the fabrication of zinc oxide negative cathode wherein zinc oxide electrode is prepared without using any zinc plate or mesh as a support for the zinc oxide paste consisting of additional agents.

2. The process makes use of a few copper or silver wires inserted in the zinc oxide paste spread to form the cathode without the support of a zinc mesh grid or a plate.

R. BHASKAR PAI

Patent Officer,

Council of Scientific & Industrial Research.

Dated this 10th day of February 1966.

COMPLETE SPECIFICATION.

COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH, RAJ MARG, NEW DELHI 1, INDIA, AN INDIAN REGISTERED BODY INCORPORATED UNDER THE REGISTRATION OF SOCIETIES ACT (ACT XXI OF 1860).

This is an invention by DR. PREM BEHARI MATHUR and NALLA GOUNDAR KARUPPANNAN, both of Central Electrochemical Research Institute, Karaikudi-3, S. Rly, India, both Indian citizens.

The following specification particularly describes and ascertains the nature of this invention and the manner in which it is to be performed.

This invention relates to the improvements in or relating to the zinc oxide negative electrode of silver oxide zinc secondary batteries.

Hitherto it has been the common practice to fabricate zinc oxide negative electrode by pasting zinc oxide on zinc mesh or zinc plate which acts as the support for the active material (zinc oxide) as well as the medium of conduction of the current.

The following are the draw-backs of the hitherto known process of fabrication of the negative electrode :

1. The metallic base in individual electrodes subscribe additional weight to the electrodes and hence to the Batteries incorporating the latter.

2. The plain surface of zinc base is largely susceptible to the passivation under the high drain of current at ordinary and at sub-zero temperatures, and hence the cells with these zinc electrodes do not give satisfactory performance at high rate of charging and discharging over the operational temperature range.

3. The cells incorporating zinc plate or mesh supported negative electrodes do not exhibit their full capacities in the initial several cycles because of non-availability of the large surface area of Zinc.

4. These electrodes give lower power output in initial several cycles owing to the volume occupied by the metal base sheet and the composition of the paste.

The object of the invention is :

(1) To obviate the disadvantages of the display of the low capacity per unit weight and volume of the negative electrode.

(2) To obviate the unsatisfactory performance of the electrodes at a high rate of current drain and at low temperatures when used in a battery owing to their tendency of passivation.

(3) To obviate the disadvantage of the lower energy out-put in the initial several cycles of the cells incorporating these negative electrodes.

According to the present invention, the process for the fabrication of zinc oxide negative electrode for use in secondary batteries or accumulators consists in pressing a zig-zag or like turned wire in a mixture comprising zinc oxide, a bivalent metal and bivalent metal compounds and an organic bivalent metal and bivalent metal compounds and an organic binder, and wrapping the pressed electrode with tissue paper, cellophane paper and/or nylon cloth.

(a) A silver or copper wire turned into zig-zag or any other suitable shape is placed within the zinc oxide mix ; the wire acts as the medium of conduction of the current inside the negative electrode ;

(b) Addition agents and an organic binder are used in the negative electrode mix ;

Price : TWO RUPEES.

(c) The negative electrode material is pressed over the silver or copper wire during the fabrication of the electrode.

The incorporation of the above mentioned features in the fabrication of the negative electrode renders

(i) The improvements in the charge and discharge characteristics of zinc oxide electrode in silver oxide zinc batteries operated at high currents;

(ii) The attainment of the rated ampere-hour capacity of the cells even in first two cycles of charging and discharging,

(iii) Improvements in the overall ampere hour capacity per unit weight and volume of the cell by incorporating additional quantities of active materials within the specified volume of a cell, in lieu of supporting grid in the negative electrodes, and

(iv) Improvements in low temperature performance of the cells by avoiding factors leading to the passivation of negative electrode at sub-zero temperatures.

EXAMPLES

A silver wire is turned in zig-zag shape and placed inside a weighed quantity (16 grams) of zinc oxide mixture which is containing 1 gram of cadmium oxide, 2 grams of zinc powder and small traces totalling 1 gram of other divalent metal compounds and 4 cc of organic binder solution. The zinc oxide mixture is spread uniformly over a tissue paper of 6 cm x 4 cm area. The tissue paper is turned and wrapped around the zinc oxide mixture. This zinc oxide plate is pressed in hydraulic press at the pressure of half ton for 2 minutes duration. Later the plate is removed and wrapped in cellophane paper for use in batteries.

Noteworthy features

1. In the process for the fabrication of the zinc oxide negative cathode, zinc oxide electrode is prepared without using any zinc plate or mesh as a support for the zinc oxide paste consisting of additional agents.

2. A silver or copper wire turned into a proper shape supports the electrode material and acts as a medium of conduction as well as the lead for the zinc oxide electrode.

3. Cadmium oxide, zinc powder and other addition agents of divalent metal compounds and organic binder are used.

4. The paste material carrying silver or copper or other metal or alloy wire is pressed for making the negative electrode.

5. The electrode paste consists of organic binders which do not react with paste materials.

6. The negative plate as prepared above is wrapped by tissue paper, cellophane paper or nylon cloth or combinations of these materials.

We claim :

1. A process for the fabrication of zinc oxide negative electrode for use in secondary batteries or accumulators which consists in pressing a zig-zag or like turned wire in a mixture comprising zinc oxide, a divalent metal and divalent metal compounds and an organic binder, and wrapping the pressed electrode with tissue paper, cellophane paper and/or nylon cloth.

2. A process for the fabrication of zinc oxide negative electrode for secondary batteries substantially as hereinbefore described in the example.

3. A process of fabrication of zinc oxide negative electrode for secondary batteries substantially as hereinbefore described.

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Dated this 8th day of November 1966.