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IMPROVEMENTS IN OR RELATING TO THE FABRICATION OF CUPROUS CHLORIDE ACTIVATED CELLS.

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

This is an invention by DR. PREM BEHARI MATHUR, DR. ROSHANLAL SETH, SARVASHRI KANAKARAJAN DAKSINAMURTHI, PANAMATTATH NARAYANAN NARAYANAN NAMBOODIRI and NARASIMHAN VENKATAKRISHNAN all of the Central Electrochemical Research Institute, Karaikudi-3, S. Rly., India, all Indian citizens.

The invention relates to improvements in or relating to the fabrication of cuprous chloride activated cells.

Hitherto only cuprous chloride pasted grid cathodes were used and in the fabrication of high tension battery this pasted cathode is used along with anode, making use of copper foil. Only uncoated magnesium or magnesium alloy anode has been in use.

In this invention use has been made of the baked cuprous chloride electrode as cathode. The backed electrode can be used with duplex magnesium or magnesium aluminium alloy anode (AZ31) obtained by plating one side of the anode with copper. This cathode can be used with magnesium, magnesium alloy or any other active metal anode such as aluminium or zinc. The presence of copper mesh as support for cuprous chloride al o adds to the volume of the electrode and hence reduces the ampere-hour capacity of a single cell per unit volume. The reduction in volume takes place on account of the following steps :

(a) The replacement of the cuprous chloride pasted electrode by baked cuprous chloride cathode brings about a reduction in volume as the latter becomes more compact as a result of baking.

(b) The elimination of the copper grid in the original cell of the battery by substituting in its place duplex electrode re ults in reduction on space. The other aspects related to the design of the cells responsible for the leakage current, inconsistency of the cell voltage over a wide current density range etc. required improvements because the copper foil has to be sealed with the anode with suitable material to avoid electrolytic contact and leakage current and hence chances of getting imperfection are not ruled out whereas the duplex system has no such limitation.

The Object of this invention is :

(a) To obviate the disadvantages of metal plate grid incorporation in the cathode by avoiding it and thus improving ampere-hour capacity per unit volume of the cell.

(b) To obviate the difficulties of leakage current and inconsistency of cell voltage over a wide range of current drains by rendering improvements in the cell design.

(c) To obviate the oxidation of cuprous chloride in the cathode by avoiding contact of pure water with cuprous chloride in the course of fabrication of the cell electrode.

(d) To obviate the problem of connecting individual cells to form battery and at the same time bringing a perfect separation among them by making use of duplex electrodes. To these ends the invention broadly consists in :

(1) Developing a process for the preparation of baked cuprous chloride electrodes. The baked plates being thin, light in weight and strong result in economy of space and retards the oxidation of the cathode material.

(2) Improving the cell design by effecting proper insulation soldering of the anode plate like magnesium alloy plate used in cuprous chloride magnesium cells and using a duplex electrode to simplify the battery fabrication and to avoid leakage currents which result in heating up of the cell system and spoiling its performance.

This invention eliminates the use of grid electrode, and the separate copper foil. It introduces use of a baked electrode and duplex anode which simplifies the cell design, fabrication and improves the performance characteristics of the water activated batteries.

According to the present invention, the process for the fabrication of cuprous chloride cells consists in either pasting or baking at low temperature (70°C. to 80° C.) cuprous chloride mix after applying it on the copper face of a copper-magnesium duplex electrode or the mix is pressed and baked at elevated temperature (300° C. to 400° C.) for the fabrication of the electrodes.

The process for making baked cuprous chloride electrode to be used with duplex magnesium anode has not been reported so far and indicates its applications in water activated cells.

Example 1.

Cell Fabrication using High Temperature Baked Cathode

85 grams of cuprous chloride and 15 grams of 150 mesh copper powder are intimately mixed and sieved through 150 mesh sieve. Take 15 grams of this mixture and spread within copper frame die of 6.5 × 4.5 cm^2 area placed over a mica sheet on mild steel plate and after uniform spreading cover with another mica sheet. The powder so spread is pressed in a hydraulic press. The pressed plate is baked in a furnace within a temperature range of 375° to 395° C. for a period of 5 to 20 minutes. Cathode plate is made by pressing this plate singly or in pair placed over a bunch of copper wires or mesh. For the fabrication of cuprous chloride magnesium single cell two numbers of duplex magnesium alloy plates produced by plating copper on one face of the plate and covering all the edges by an insulating material, are taken and copper wire leads are soldered to them and joined together to form two parallel anodes. One copper wire supported cuprous chloride cathode wrapped in a filter paper is placed in between the two anodes. The magnesium faces are facing towards the cathode. Two such cells on being discharged at different rates in 3% NaCl aqueous solution gave the following performance characteristics.

CELL CHARACTERISTICS	CELL I	CELL II
1. Weight of cathode plate	13.5 g	10 g
2. O.C.V.	1.475 V	1.475 V
3. Peak Voltage during discharge	1.38 V	1.42 V
4. Discharge current	0.5 A	0.2 A
5. Discharge capacity	2.25 AH	1.80 AH
6. Duration of discharge at voltage greater than 1.2	5.20 Hrs.	8.20 Hrs.

The main advantages of the invention are that the cell design and performance of the characteristics as indicated earlier are facilitated with the use of baked cuprous chloride electrode along with the duplex magnesium electrode.

The substitution of baked cuprous chloride cathode and duplex magnesium electrode in place of the conventional pasted cathode and uncoated magnesium anode improves the cell design and performance characteristics besides improving the capacity per unit volume of a single cell.

Price : TWO RUPEES.

EXAMPLE 2.

Cell Fabrication using Low Temperature Baked Cathode

The copper face of the duplex electrode is coated with an aqueous mix consisting of cuprous chloride (80%) impregnated with 1.2% acetylene black and 1.0% polyvinyl alcohol and baked in an oven at 70° to 80° C., for two to four hours. The plates were then removed and coated with insulating material such as plastic solution at their edges. Two such electrodes placed alternately separated by treated cotton pad are used in the fabrication of magnesium cuprous chloride cells.

We claim :

1. A process for the fabrication of cuprous chloride activated cells which consists in either pasting and baking at low temperature (70°C. to 80°C.) cuprous chloride mix after applying it on the copper face of the copper-magnesium duplex electrode or the mix is pressed and baked at elevated temperature (380°C. to 400°C.) for the fabrication of the electrodes.

2. The process as claimed in the preceding claim wherein the cuprous chloride consists of a conducting material like copper powder, acetylene black, graphite powder lamp black in presence or absence of additional agents like polyvinyl alcohol and allied compounds.

3. The process as claimed in any of the preceding claims wherein the electrodes are baked at low temperature ranging from room temperature to 120° C. using additional agent or baked at elevated temperature ranging from 330° C. to 400° C. in the absence of additional agent.

4. The process as claimed in any of the preceding claims wherein duplex plates consisting of magnesium/magnesium alloy sheet-clad with copper foil or plated with copper is used as electrode elements after sealing the magnesium copper edge interface with insulating material.

5. A process of fabrication of cuprous chloride activated cell as substantially hereinbefore described.

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