
Index of acceptance 73/5811/5.6.

INDENTIFICATION IN RELATION TO THE PREPARATION OF
SOLARIC OXIDE ELECTRODES FOR USE IN ALKALINE MERCURY
BATTERIES.

Council of Scientific and Industrial Research, Half Marg, New Delhi 1, India, an Indian registered body incorporated under the Registration of Societies Act (Act XII of 1860).

The following specification describes the nature of this invention.

This is an invention by Srijanavna Saragapani, Associate, Scientific Assistant, Dr. Brijendra Jha Paul, Scientist, B. Srijanavna Vasantdev, Senior Scientific Assistant, and Dr. Brijendra Jha Paul, Senior Scientific Assistant and Brijendra Jha Paul, Vasantdev, all Indian Citizens working in the Central Electrochemical Research Institute, Kasauli 3 (Kashmir)

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This invention relates to improvements in or relating to the preparation of amorphous oxide electrodes for use in alkaline mercury oxide cells.

Inventors have been proposed to make the amorphous oxide plate electrodes using a metal matrix which has been electrolytically (Patent No. 900819), but consisting of amorphous oxide powder adhering to the use of carbon or graphite or amorphous oxide, in black proportions (inorganic). 511 is a binder of known quantity and composition so as to make it adhere to the matrix (Patent No. 116440), and is by means of pasting and pressing and other after treatments. It is known in literature that metal oxides like Ni, Co, As, Mo, and Nb are isolated in anode plates and cathodes for various reasons.

This is open to the objection that when the cells are set up at various levels of discharge, the mercury metal from the electrode blocks, upon a certain extent, are retained in the form of the block in the form of finely dispersed droplets and beyond certain state of discharge, they tend to trickle down the electrode and collect at the bottom of the cell, thus endangering a short circuit between electrodes and causing the cell to cease to its life's best. Just like the sludge in the secondary battery, this is a possible cause for sudden failures causing healthy cells which otherwise would have lived for some time.

The object of this invention is to obviate these disadvantages by careful planning of the design and pattern of the electrode, whereby some mercury could be held on to it as amalgam in 'tail' condition. This can accommodate only very low percentage of the total amount of mercury. On the other hand, by manipulating the binder composition (non-setting type) quantity and the pressure, the plate thickness (therefore as a result of porosity) could be controlled. This also could not accommodate all the mercury metal in the pores of the plate. It has been found that if the mercury could be held in the electrode block in the form of amalgam (very similar to the matrix being amalgamated very heavily and accounting for holding large quantity of mercury in 'tail'), this danger of shorting between electrodes could be averted.

In these cells, the invention broadly consists in making amorphous oxide electrodes using certain metal powders with the mix with the purpose of amalgamating the mercury which otherwise would be trickled and collected and would have caused shorting problem. The metal powders incorporated in the matrix oxide mix is, in no way, interferring with the expected performance characteristics of the electrode which normally consists of only mercury oxide and amorphous oxide block. The metal powder incorporated must be so chosen that it can easily form amalgam or 'setting' with mercury; the metal powder incorporated disperses with the use of amorphous block so far used which is a bulky material thereby resulting in the formation of very thin amorphous block which may add to capacity/unit volume; the metal powder in this case being good conductors themselves serve the function of the amorphous block meant for the purpose. To this intent, the metals best suited are in the group iron, cobalt, nickel, aluminum, copper and gold.

The following typical examples are given to illustrate the invention:

EXAMPLE 1

A matrix oxide electrode is prepared in the following manner:

A metal matrix electrode (Patent No. 90153) which has been electrolytically coated with the amorphous oxide mix of the composition:

(a) Silver metal powder (40% 40 mesh) 50-100, 50-100-
(b) Acrylamide block 0-18, 0-18-
(c) binder of known quantity and composition so as to make it adhere to the matrix (Patent No. 116440) by means of pasting, pressing and other after treatments. This electrode used in connection with a silver electrode forms a mercury oxide cell, the discharge characteristics of which are compared with a cell incorporating amorphous oxide electrode in which no metal power has been added.

EXAMPLE 2

A mercury oxide electrode (as prepared in Example 1) without amorphous metal block is prepared with the following composition:

(a) Nickel oxide (200 mesh) 50% by weight
(b) Metal powder (40-40 mesh) powder 50% Acrylamide block 0-18, 0-18-
(c) binder of known quantity and composition as in Example 1.
This invention relates to improvements in or relating to the preparation of mercuric oxide electrodes for use in alkaline mercuric oxide cells.

It has been found that the mercuric oxide plate electrodes using a) metal matrix which has been electrolytically deposited (Indian Patent No. 402621), b) mix comprising mercuric oxide made conducting by the use of carbon or graphite or acetylene black in right proportion (Indian Patent No. 114460), c) a binder of known quantity and composition so as to make it adherent to the matrix (Indian Patent No. 114460) and d) by means of pasting and pressing and other after treatments. It is known in literature that foreign metals like Pt, Co, Ag, Ni and Mg are included in amode plates and cathodes for various purposes.

This is an invention by Bipinwadi Sarangpuri, Senior Scientific Assistant, Dr. Nityanand Joshi, Scientist, Narsimhalu R. Mehta, Senior Scientific Assistant, and Dr. Narayan Sinha, Scientist, all working in the Central Electrochemical Research Institute, Ennurwadi, 3 (Tezpur Road) and all Indian Citizens.

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

The main object of this invention is to obviate these disadvantages by careful planning of the design and pattern of the anode where by some mercury could be held on to the electrode as amalgam in 'well' condition. This can accommodate only very low percentage amount of mercury. On the other hand, by manipulating the binder composition, (non-rusting type), quantity and the pressure, the plate thickness (therefore as a result porosity) could be controlled. This also could not accommodate all the mercury metal in the pores of the plate. It has, therefore, been found that if the mercury could be held in the outside blocks in the form of amalgam (very similar to the matrix being amalgamated very heavily and accounting for housing less quantity of mercury in 'well'), this danger of shifting between electrodes could be averted.

According to the present invention, there is provided a process for making cathodes for mercuric oxide cells by pasting a depolarizer mix of mercuric oxide and a binder such as acetic, methyl cellulose, polyvinyl alcohol or ppara solution on a matrix electrode characterized in that metal powders such as iron, cobalt, nickel, copper, silver, gold are incorporated with the mix.

The depolarizer mix is compounded by applying pressures of the order of 5 to 50 tons to attain a thickness of 1 to 3 mm.

Metal powder of particle size ranging from +40 to +300 mesh is used. The powder is added in the depolarizer mixture of mercuric oxide and metal powder.

The particle size of the depolarizer mercuric oxide lies between +40 to +90 mesh, preferably of 200 mesh size and the particle size of the metal powder lies between +100 to +150 mesh, preferably +100 mesh size.

The metal powders before adding to depolarizer are given a suitable pre-treatment such as a dip in 20% aqueous nitric or 10% hydrochloric acid for five minutes and annealed in air oven under inert atmosphere. A pressure of 5-50 tons is applied, preferably 35 tons, for compacting the depolarizer mixture and the binder.

Thus, mercuric oxide electrodes are made using certain metal powders with the mix with the purpose of amalgamating the mercury which otherwise would be trapped and collected and would have caused shorting problems. The metal powders incorporated in the mercuric oxide mix is, in no way, interfering with the expected performance characteristics of the electrodes which normally consists of only mercuric oxide and acetylene black; the metal powder incorporated is so chosen that it can easily form amalgam or 'balancing' with mercury; the metal powder incorporated disperses with the use of acetylene black so far used which is a bulky material thereby resulting in the formation of very thin, slim cathode blocks which may add to capacity/unit volume; the metal powders are given a pre-treatment to remove the inherent oxide film and being good conductors themselves serve the function of the acetylene black mean for the purpose. The pre-treatment, for example, consists in treating the metal powders in dilute acid or a suitable solvent to remove the oxide or the stabilizer film. To this extent, the metals best suited are in the group iron, cobalt.