ABSTRACT

AN ELECTRIC BATTERY CONTAINING TANNERY EFFLUENT AS AN ELECTROLYTE

The invention provides an electric battery that comprises a combination of cells connected either in parallel or series. Each cell is composed of one positive electrode selected from carbon, lead; a negative electrode selected as Iron; and an electrolyte prepared from chemically modified tannery effluent water using an inorganic salt. Advantage of the invention is to utilize the tannery effluent water which causes pollution to the environment.

ORIGINAL

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WE CLAIM

1. An electric battery comprising a plurality of cells wherein, each cell comprises at least one positive electrode and at least one negative electrode placed in an electrolyte characterized in having electrolyte comprising 2% to 20% w/w tannery effluent and 80% to 98% w/w inorganic salt.
2. The electric battery as claimed in claim 1, wherein each cell is enclosed in an electrically insulated enclosure made up from an electrically insulating material comprising of polymer or non-polymer.
3. The electric battery as claimed in claim 1, wherein, the positive electrode used is selected from the group consisting of carbon and Lead.
4. The electric battery as claimed in claim 1, wherein the negative electrode used is Iron.
5. The electric battery as claimed in claim 1, wherein the tannery effluent comprises of water 80-95 %, Total Nitrogen concentration 10-1000 mg/liter, Ammonical Nitrogen 10-1000 mg/liter, Sulfide 10-1000 mg/liter, Chromium concentration 10-1000 mg/liter.
6. The electric battery as claimed in claim 1, wherein the inorganic salt used is Ferric sulphate.
7. The electric battery as claimed in claim 1, wherein life cycle of the battery is in the range of 900 to 1100 cycles.
8. The electric battery as claimed in claim 1, wherein the plurality of cells are in the range of 5 to 10 and cells are connected in parallel or series.
9. The electric battery as claimed in claim 1, wherein said battery exhibit circuit voltage of 1.5V to 1.6V and 9.0V to 9.6V when six cells connected in parallel and series respectively.

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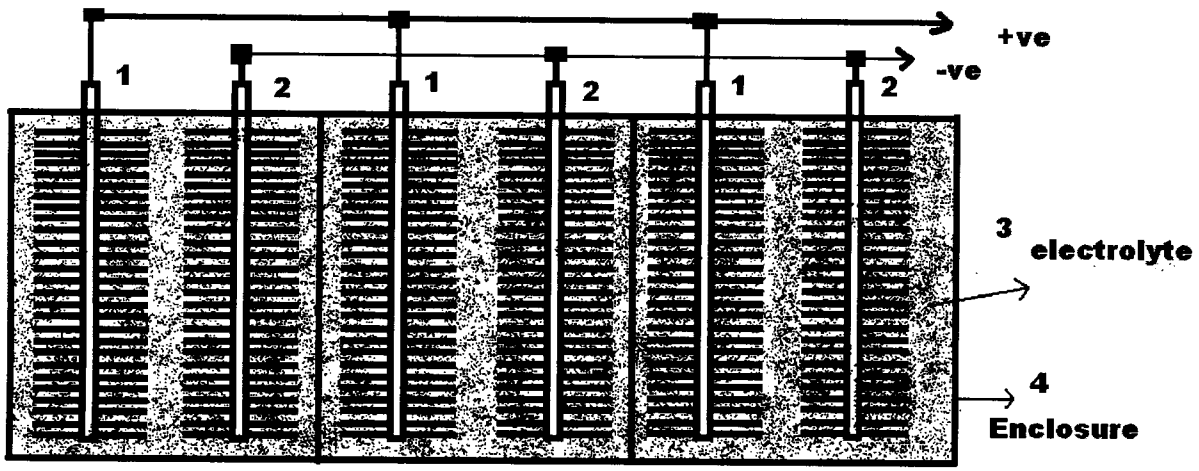

Fig-1

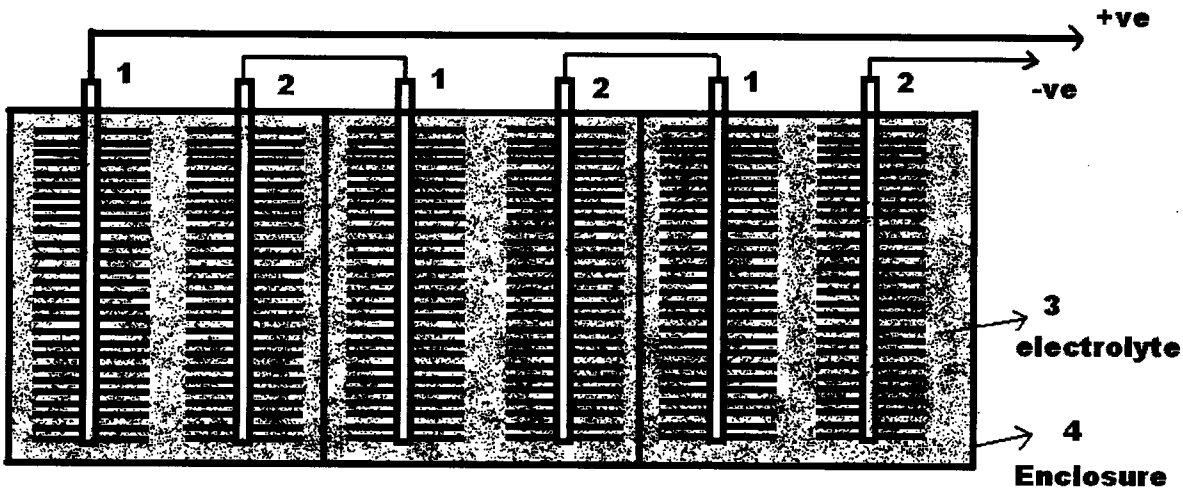

Fig-2

APPLICANT

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TECHNICAL FIELD OF THE INVENTION

The present invention relates to an electric battery containing an electrolyte made from tannery effluent water. Particularly, the present invention relates to a battery prepared from chemically modified tannery effluent water with the addition of an inorganic salt. More particularly, the present invention relates to an electric battery that produces an open circuit voltage of 1.5V to 1.6V and 9.0V to 9.6V when six cells are connected in parallel and series, respectively, in the battery.

BACKGROUND AND PRIOR ART OF THE INVENTION

From long time water activated batteries are known which comprises various ionic solutions as electrolyte. In 1952, a novel sea water battery has invented and patented by Taylor (US pat 2590584) that generate electricity comprises magnesium disc as anode, silver coating on silver chloride disc as cathode. Later, this concept has been modified by Horace (US pat. 2988587, 1961), Saslow (US pat. 3148090, 1964) in the design of the electrodes. Finally by Dhanji (US pat. 5665487, 1997) that comprises a cathode made of a chloride member with a silver coating on its surface or it is a silver chloride cathode, magnesium plate as anode.

In 1973, a novel Lime water battery has been invented and patented by Chazhukaram (IN 138323) that produces electricity comprises lime water with caustic soda as electrolyte, Aluminium as negative electrode and carbon as positive electrode with manganese dioxide and carbon powder as depolarizer.

In 1977, a novel water activated battery has been invented and patented by Birt (US pat. 4020247) that comprises a cathode manufactured from an oxy-halogen material, an anode of aluminium, magnesium, zinc or alloys thereof. Later different types of water activated batteries have been found by Khasin (US pat. 5424147, 1995) that comprises a anode selected from magnesium, Aluminium, Zinc or its alloy, a cathode comprising a skeletal frame of conducting metal formed of cuprous chloride, sulfur, carbon and a water-ionizable salt ($CaSO_4$), Mc Carter (US pat. 5395707, 1995) has invented a water activated battery that comprises cuprous iodide as cathode and magnesium as anode and finally by Birt (US pat. 4185143, 1980) has invented a water rechargeable battery that employs a metal / organo-halogen couple including an anode member and a cathode member.

None of the above inventions used tannery effluent water in developing a battery. Leather industries generate enormous amount of tannery effluent water that contains chromium, organic and inorganic substances which cause major problem of disposal. It is worth to use this liquid waste in developing a battery, thereby providing an economical option for its disposal. Therefore the present invention proposes an electric battery from chemically modified tannery effluent.

OBJECTIVE OF THE INVENTION

The main object of the present invention is to provide an electric battery containing an electrolyte made from tannery effluent water which is a waste product from tanneries.

Another objective of the present invention is to provide an electric battery wherein tannery effluent is used as a raw material in making an electrolyte by converting it into an electrolyte by adding an inorganic salt.

SUMMARY OF THE INVENTION

Accordingly, present invention provides an electric battery comprising a plurality of cells wherein, each cell comprises at least one positive electrode and at least one negative electrode placed in an electrolyte characterized in having electrolyte comprising 2% to 20% w/w tannery effluent and 80% to 98% w/w inorganic salt.

In an embodiment of the present invention, each cell is enclosed in an electrically insulated enclosure made up from an electrically insulating material comprising of polymer or non-polymer.

In another embodiment of the present invention, the positive electrode used is selected from the group consisting of carbon and Lead.

In yet another embodiment of the present invention, the negative electrode used is Iron.

In yet another embodiment of the present invention, the tannery effluent comprises of water 80-95 %, Total Nitrogen concentration 10-1000 mg/liter, Ammonical Nitrogen 10-1000 mg/liter, Sulfide 10-1000 mg/liter, Chromium concentration 10-1000 mg/liter.

In yet another embodiment of the present invention, the inorganic salt used is Ferric sulphate.

In yet another embodiment of the present invention, life cycle of the battery is in the range of 900 to 1100 cycles.

In yet another embodiment of the present invention, the plurality of cells are in the range of 5 to 10 and cells are connected in parallel or series.

In yet another embodiment of the present invention, said battery exhibit circuit voltage of 1.5V to 1.6V and 9.0V to 9.6V when six cells connected in parallel and series respectively.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig-1 is a view of the proposed battery that consists of positive electrodes [1], negative electrodes [2], electrolyte [3] and an electrically insulated enclosure [4] in which the positive electrodes are connected in parallel and the negative electrodes are also connected in parallel so that the current is summed.

Fig-2 is a view of the present battery wherein the positive and negative electrodes are connected in series so that the voltage is summed.

DETAILED DESCRIPTION OF THE INVENTION

The present invention relates to an electric battery that comprises of a combination of cells connected either in parallel or series as shown in fig-1 and fig-2 respectively. Each cell is composed of a positive electrode, a negative electrode and an electrolyte and is enclosed in an electrically insulated material.

The raw tannery effluent water collected from tannery industries composed of 80-90% water, Total Nitrogen concentration 800-850 mg/liter, Ammonical Nitrogen 110-120 mg/liter, Sulfide 230-240 mg/liter, Chromium concentration 13-14 mg/liter.

The electrolyte used in the said battery comprises the above said tannery effluent waste water and Inorganic salt selected as Ferric sulphate.

The positive electrodes used in making the battery may be selected from carbon, silver, lead, gold and nickel as either individually of in any combination. Similarly, the negative electrodes used in making the battery may be selected from zinc, aluminium, iron, magnesium, lead oxide and lead dioxide either individually or in any combination. The electrodes are in the form of skeleton where circular/planar sheets are arranged in parallel or series as shown in fig-1 & fig-2 to improve the surface area. The above said electrodes and electrolyte were placed in an electrically insulated envelop made of plastic, PVC, acrylic,

nylon, Teflon, Perspex etc. or any polymeric or non-polymeric electrical insulators. The electrodes used in the above battery are provided with electrical contact by soldering with electrically conductive metals such as copper, aluminum etc. and connected either in parallel or series as shown in fig-1 & fig-2 respectively.

The positive electrodes used in making the battery may be selected from Carbon and Lead. Similarly, the negative electrode used in making the battery was Iron.

EXAMPLES

The following examples are given by way of illustration therefore should not be construed to limit the scope of the invention.

Example-1

1 liter of tannery effluent water containing water 80%, Total Nitrogen concentration 10 mg/liter, Ammonical Nitrogen 10 mg/liter, Sulfide 10 mg/liter, Chromium concentration 10 mg/liter was taken and to this solution, 1500 grams of Ferric sulfate was added. Carbon was used as positive electrode and Iron as negative electrode. The 6-cells are connected in parallel in the battery and it produced an open circuit voltage of 1.5 V. If 6-cells are connected in series, the battery produces 9.0 V. The electrodes used in the battery are planar in shape. The life of the battery is 1000 cycles. The total reaction of the cells is as follows.

$Fe + Fe_2 (SO_4)_3 + 6\ H_2O \leftrightarrow 3\ Fe(OH)_2 + 3\ H_2SO_4$

Example-2

1 liter of tannery effluent water containing water 95%, Total Nitrogen concentration 1000 mg/liter, Ammonical Nitrogen 1000 mg/liter, Sulfide 1000 mg/liter, Chromium concentration 1000 mg/liter was taken and to this solution, 1500 grams of Ferric sulfate was added. Carbon was used as positive electrode and Iron as negative electrode. The 6-cells are connected in parallel in the battery and it produced an open circuit voltage of 1.5 V. If 6-cells are connected in series, the battery produces 9.0 V. The electrodes used in the battery are planar in shape. The life of the battery is 1000 cycles. The total reaction of the cells is as follows.

$Fe + Fe_2 (SO_4)_3 + 6\ H_2O \leftrightarrow 3\ Fe(OH)_2 + 3\ H_2SO_4$

Example-3

1 liter of tannery effluent water (water 80%, Total Nitrogen concentration 10 mg/liter, Ammonical Nitrogen 10 mg/liter, Sulfide 10 mg/liter, Chromium concentration 10 mg/liter) was taken and to this solution, 1500 grams of Ferric sulfate was added. Lead was used as positive electrode and Iron as negative electrode. The 6-cells are connected in parallel in the battery and it produced an open circuit voltage of 1.6 V. If 6-cells are connected in series, the battery produces 9.6 V. The electrodes used in the battery are planar in shape. The life of the battery is 1000 cycles. The total reaction of the cells is as follows.

$3Pb + Fe + Fe_2(SO_4)_3 + 3H_2O \leftrightarrow 3FeO + 3PbSO_4 + 3H_2$

Example-4

1 liter of tannery effluent water (water 95%, Total Nitrogen concentration 1000 mg/liter, Ammonical Nitrogen 1000 mg/liter, Sulfide 1000 mg/liter, Chromium concentration 1000 mg/liter) was taken and to this solution, 1500 grams of Ferric sulfate was added. Lead was used as positive electrode and Iron as negative electrode. The 6-cells are connected in parallel in the battery and it produced an open circuit voltage of 1.6 V. If 6-cells are connected in series, the battery produces 9.6 V. The electrodes used in the battery are planar in shape. The life of the battery is 1000 cycles. The total reaction of the cells is as follows.

$3Pb + Fe + Fe_2(SO_4)_3 + 3H_2O \leftrightarrow 3FeO + 3PbSO_4 + 3H_2$

ADVANTAGES OF THE PRESENT INVENTION

1. The main advantage of the present invention is to utilize tannery effluent waste water, which is a waste product from leather industry, in preparing a value added product by making a battery and thereby providing an economical option for its disposal.
2. The present invention provides a simple and economical process for the preparation of a battery.
3. The battery requires only tannery effluent to recharge.
4. The cost of production and maintenance of the proposed battery is cheaper.