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

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IMPROVEMENTS IN OR RELATING TO THE PRODUCTION OF ELECTROLYTIC MANGANESE DIOXIDE SUITABLE AS DEPOLARISER FOR PRIMARY BATTARIES.

COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH, Rafi Marg, New Delhi-1, India, and Indian Registered Body incorporated under the Registration of Societies Act (Act XXI of 1860).

This is an invention by VEERARAGHAVA ARAVAMUTHAN and SRINIVASAIYER VISVANATHAN, Scientists in the Central Electrochemical Research Institute, Karaikudi-3, Southern Railway, both Indian Nationals.

The following specification describes the nature of this invention.

This invention relates to improvements in or relating to the production of Electrolytic Manganese Dioxide suitable as depolariser in primary cells with special reference to the utilisation of low and high grade manganese ores occurring in India.

Hitherto it has been proposed to use mixtures of manganese sulphate plus sulphuric acid or manganese nitrate as electrolyte for the electrolytic deposition of manganese dioxide.

This is open to objection that the deposited manganese dioxide is rather very adherent to the anodes. This comes in the way of efficient recovery of the products besides causing deterioration to the substrate graphite plates.

The object of this invention is to obviate these disadvantages by choosing a suitable electrolyte from which the deposited manganese dioxide is easily recovered with least damage to the graphite substrate.

To these ends, the invention broadly consists in electrolysing manganese chloride solution obtained by leaching reduced manganese ore with hydrochloric acid as described hereunder.

The following typical conditions are given to illustrate the invention :

Example

18 hours of continuous electrolysis

Conditions were standardised in a 300 ampere cell.

Electrolytic vessel—Rubber lined mild steel tank of the following dimensions : 100 cm×38 cm×46 cm.

Cathode—Perforated graphite plates (1.2 cm dia perforations having a distance of 4.5 cm between any two perforations) 11 such Nos.

Anode—Perforated graphite plates (1.2 cm dia. perforations having a distance of 4.5 cm between any two perforations) 10 such Nos.

Current passed—300 amps ; total 5250 amp. hrs.

Current density—1 amp/dm^2 both for anode and cathode

Bath voltage—2.2 volts (average).

Electrolyte—150 litres of manganese chloride of 55 gms to 35 gms Mn ++ /litre.

Temperature—80-85°C.

Inter electrode distance—7.5 cm anode to anode.

pH of the electrolyte—5 (to start with).

Nature of the deposit—Very good. Stripping was easy.

Weight of manganese dioxide obtained—5.79 kg (average).

Current efficiency—67.5 per cent (average).

Energy consumption—2 kwh/kg of manganese dioxide.

Hydrochloric acid loss—0.497 kg. of HCl/kg. of manganese dioxide (average).

The following are among the main advantages of the invention :

(a) Good quality manganese dioxide suitable for battery depolariser can be obtained electrolytically from low and high grade manganese ore by a cyclic process.

(b) Minimum consumption of graphite anodes.

(c) Cheap raw materials, viz., low grade manganese ores, by product hydrochloric acid, etc.

R. BHASKAR PAI

Patent Officer,

Council of Scientific and Industrial Research.

Dated this 17th day of October, 1964.

COMPLETE SPECIFICATION.

IMPROVEMENTS IN OR RELATING TO THE PRODUCTION OF ELECTROLYTIC MANGANESE DIOXIDE SUITABLE AS DEPOLARISER FOR PRIMARY BATTERIES.

COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH, Rafi Marg, New Delhi-1, India, and Indian Registered Body incorporated under the Registration of Societies Act (Act XXI of 1860).

This is an invention by VEERARAGHAVA ARAVAMUTHAN and SRINIVASAIYER VISVANATHAN, Scientists in the Central Electrochemical Research Institute, Karaikudi-3, Southern Railway, both Indian Nationals.

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 improvements in or relating to the production of electrolytic manganese dioxide suitable as depolariser in primary cells with special reference to the utilisation of low and high grade manganese ores occurring in India.

Hitherto it has been proposed to use mixtures of manganese sulphate plus sulphuric acid or manganese nitrate as electrolyte for the electrolytic deposition of manganese dioxide.

This is open to objection that the deposited manganese dioxide is rather very adherent to the anodes. This comes in the way of efficient recovery of the products besides causing deterioration to the substrate graphite plates.

The object of this invention is to obviate these disadvantages by choosing a suitable electrolyte from which the deposited manganese dioxide is easily recovered with least damage to the graphite substrate.

To these ends, the invention broadly consists in electrolysing manganese chloride solution obtained by leaching reduced manganese ore with hydrochloric acid as described hereunder.

The following typical conditions are given to illustrate the invention :—

Example

18 hours of continuous electrolysis conditions were standardised in a 300 ampere cell.

Electrolytic vessel—Rubber lined mild steel tank of the following dimensions : 100 cm×38 cm×46 cm.

Cathode—Perforated graphite plates (1.2 cm dia. perforations having a distance of 4.5 cm between any two perforations) 11 such Nos.

Anode—Perforated graphite plates (1.2 cm dia. perforations having a distance of 4.5 cm between any two perforations) 10 such Nos.

Price : TWO RUPEES.

Current passed—300 amps ; total 5250 amp. hrs.
Current density—1 amp/dm² both for anode and cathode.
Bath voltage—2.2 volts (average).
Electrolyte—150 litres of manganese chloride of 55 gms. to 35 gms. Mn ++ /litre.
Temperature—80-85°C.
Inter electrode distance—7.5 cm anode to anode.
pH of the electrolyte—5 (to start with).
Nature of the deposit—Very good. Stripping was easy.
Weight of manganese dioxide obtained—5.79 kg (average).
Current efficiency—67.5 per cent (average).
Energy consumption—2 kwh/kg of manganese dioxide.
Hydrochloric acid loss—0.497 kg. of HCl/kg. of manganese dioxide (average).

The following are among the main advantage of the invention :

(a) Good quality manganese dioxide suitable for battery depolariser can be obtained electrolytically from low and high grade manganese ore by a cyclic process.

(b) Minimum consumption of graphite anodes.

(c) Cheap raw materials viz., low grade manganese ores, by-product hydrochloric acid etc.

We claim :

1. A process for the production of electrolytic manganese dioxide suitable as depolariser for primary batteries which consists in electrolysing manganese chloride solution obtained by leaching reduced manganese ore with hydrochloridic acid.

2. A process as claimed in Claim 1, wherein typical conditions illustrated in the example are used.

3. A process as claimed in Claim 1 or 2, wherein good quality manganese dioxide suitable for depolariser is obtained electrolytically from low and high grade manganese ore by a cyclic process.

4. A process as claimed in any of the preceding claims wherein by-product hydrochloric acid is used.

5. Electrolytic manganese dioxide suitable as depolariser for primary batteries, whenever obtained according to a process substantially as hereinbefore described.

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Council of Scientific and Industrial Research.

Dated this 30th day of January, 1965.

MGIPC—L(NS)—32 Patent/66—10-8-66—100.