

GOVERNMENT OF INDIA : THE PATENT OFFICE, 214, LOWER CIRCULAR ROAD, CALCUTTA-17.  
Specification No. 106806. Application No. 106806, dated 27th August 1966. Complete  
specification left on 27th April 1967. (Application accepted 20th May 1968.)

Index at acceptance—14D2 [LVIII(1)].

### PROVISIONAL SPECIFICATION.

IMPROVEMENTS IN OR RELATING TO ANODE MATERIAL AND ELECTROLYTE IN PRIMARY WET-CELL  
OF THE LECLANCHE TYPE.

COUNCIL OF SCIENTIFIC & INDUSTRIAL RESEARCH, RAFT MARG, NEW DELHI-1, INDIA, AN INDIAN  
REGISTERED BODY INCORPORATED UNDER THE REGISTRATION OF SOCIETIES ACT—ACT XXI OF 1860.

*The following specification describes the nature of this invention.*

This is an invention by NARAYANASWAMI SUBRAMANYAN, Scientist, MAHADEV GOVIND  
POTDAR, Scientist and VASUDEVA SASTRI KAPALI, Senior Laboratory Assistant, all of the Central  
Electro-chemical Research Institute, Karaikudi, Madras State, India, all Indian citizens.

This invention relates to improvements in or relating to anode material and electrolyte in Leclanche Type Primary Wet-cell.

Hitherto it has been the practice to use the conventional Leclanche wet-cell consisting of zinc as anode, ammonium chloride as electrolyte and the normal sack-element as cathode.

This is open to the objections that zinc is at present being imported and involves foreign exchange.

The object of this invention is to replace zinc, which is an imported scarce material of strategic importance, by an indigenously and easily available metal such as aluminium.

To these ends the invention broadly consists in :

(1) the use of commercial aluminium ("2S") as anode in the place of zinc;

(2) the use of alkaline solutions such as sodium hydroxide and potassium hydroxide with suitable addition agents belonging to organic and inorganic class of compounds having inhibitive and complexing properties in alkaline media;

(3) the use of commercially available, conventional Leclanche type sack-element as cathode.

The following typical examples of experiments are given in Tabular form :

Characteristics	Normal cell	The new cell
(1) Open circuit-Voltage	1.5 to 1.6V	1.6 to 1.8V
(2) Total working hours to reach the cut-off voltage of 0.75V on continuous discharge through 10 ohm resistor	1440 hours (as required by I.S. Specification for SI sack-cells)	1500 hours* at a cut-off Voltage of 0.95 volts
(3) Frequency of change of electrolyte	Once in a week	Once in a month

\*The total working hours to a cut-off voltage of 0.75V will be given in the final specification.

The following are the main advantages of the invention :

(1) Commercial aluminium ("2S") has been found quite suitable to be employed as anode in the place of zinc.

(2) This material, namely, commercial aluminium ("2S") is indigenously produced and easily available, whereas zinc is scarce and is also being imported.

(3) The electrolyte employed namely solutions based on alkaline substances, is favourable for the employment of aluminium as anode and also for the better utilization of the depolarizer.

(4) The raw-materials for the preparation of the electrolyte are all available indigenously.

(5) The conventional Leclanche type sack-elements can be satisfactorily used as cathodes in the aforesaid system.

(6) The maintenance of the cell can be expected to be easier and cheaper than that of the conventional cell.

Sd./- R. BHASKAR PAI,

Patents Officer,

COUNCIL OF SCIENTIFIC & INDUSTRIAL  
RESEARCH.

Dated this 24th day of August 1966.

### COMPLETE SPECIFICATION.

COUNCIL OF SCIENTIFIC & INDUSTRIAL RESEARCH, RAFT MARG, NEW DELHI-1, INDIA, AN INDIAN  
REGISTERED BODY INCORPORATED UNDER THE REGISTRATION OF SOCIETIES ACT—ACT XXI OF 1860.

*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 NARAYANASWAMI SUBRAMANYAN, Scientist, MAHADEV GOVIND  
POTDAR, Scientist and VASUDEVA SASTRI KAPALI, Senior Laboratory Assistant, all of the Central  
Electro-chemical Research Institute, Karaikudi, Madras State, India, all Indian citizens.

This invention relates to improvements in or relating to anode material and electrolyte in Leclanche Type Primary Wet Cell.

Hitherto it has been the practice to use the conventional Leclanche Type Wet Cell consisting of zinc as anode, ammonium chloride as electrolyte and the normal sac-element as cathode.

This is open to the object that zinc is at present being imported and involves foreign exchange.

The object of this invention is to replace zinc, which is an imported scarce material of strategic importance, by an indigenously and easily available metal such as aluminium.

We have found that commercial aluminium ("2S") (i.e., of minimum 99% purity as defined by the Indian Aluminium Company, Calcutta) can be used as anode in the place of zinc.

Price : TWO RUPEES.

We have found that alkaline solutions such as sodium hydroxide and potassium hydroxide with suitable addition agents belonging to organic and inorganic class of compounds having inhibitive and complexing properties in alkaline media are suitable for the use of commercial aluminium as anode in the Primary Wet Cell of the Leclanche Type.

We have found that the conventional Leclanche Type sac-element can be used with commercial aluminium ("2S") and the above said electrolyte to form a primary wet-cell.

According to the present invention, the primary wet-cell comprising an anode, an electrolyte and conventional sac-element used in Leclanche type primary wet-cell is characterised in that commercial aluminium is used as anode in presence of an alkaline electrolyte.

Commercial aluminium of at least 99% purity may be used as anode in any suitable shape.

The alkaline electrolyte may consist of caustic soda or caustic potash solution containing corrosion inhibitive agents like calcium hydroxide and complexing agents like sodium citrate.

The following typical examples of experiments are given in Tabular form:

**Cell Assembly:**

Anode: "2S" aluminium rods 8 in. long and  $\frac{1}{2}$  in. dia.

Electrolyte: 0.2 to 1 N. Sodium hydroxide containing 1 to 10% sodium citrate, 0.3% sodium chloride and 1 gram of slaked lime per litre.

**Sac element: Conventional Leclanche type**

Characteristics	Normal cell	New cell
(1) Open circuit-Voltage	1.5 to 1.6V	1.6 to 1.8V.
(2) Total working hours to reach the cut-off voltage of 0.75V on continuous discharge through 10 ohm resistor.	1440 hours (as required by ISI Specification for SI sac-cell)	1500 hours.
(3) Frequency of change of electrolyte	Once in a week	Once a fortnight

The following are the main advantages of the invention:

1. Commercial aluminium has been found quite suitable to be employed as anode in the place of zinc.

2. This material, viz., commercial aluminium ("2S") is indigenously produced and easily available, whereas zinc is scarce and is also being imported.

3. The electrolyte employed, viz., solutions based on alkaline substances is favourable for the employment of aluminium as anode and also for the utilization of the depolarizer.

4. The raw materials for the preparation of the electrolyte are all available indigenously.

5. The conventional Leclanche Type sac-elements can be satisfactorily used as cathodes in the aforesaid system.

6. The maintenance of the cell can be expected to be easier than that of the conventional cell.

**We claim:**

1. A primary wet-cell comprising an anode, an electrolyte and conventional sac-element used in Leclanche Type Primary Wet Cell which is characterised in that commercial aluminium is used as anode in presence of an alkaline electrolyte.

2. A primary wet-cell as claimed in Claim 1 wherein commercial aluminium of at least 99% purity is used as anode in any suitable shape.

3. A primary wet-cell as claimed in Claim 1 or 2 wherein the alkaline electrolyte consists of caustic soda or caustic potash solution containing corrosion inhibitive agents like calcium hydroxide and complexing agents like sodium citrate.

4. A primary wet-cell which gives performance characteristics comparable to those of the conventional Leclanche Type Primary Wet Cell substantially as hereinbefore described.

Sd./- R. BHASKAR PAI,

Patents Officer,

COUNCIL OF SCIENTIFIC & INDUSTRIAL  
RESEARCH

Dated this 24th day of April 1967.