GOVERNMENT OF INDIA, THE PATENT OFFICE, 214, ACHARYA JAGADISH BOSE ROAD, CALCUTTA-17. Complete Specification No.142016 dated 21st July 1975. Application No.1417/Cal/1975 dated 21st July 1975. [Divided out of No.747/72 (Serial No.137763); Ante-dated to 4th July 1972]. Acceptance of the complete specification advertised on 21st May 1977.

Index at acceptance- 14D2 [LVIII(1)]
188 [XXXIII(9)]

International classification - B 41 b 5/02
H 01 m 23/00

"IMPROVEMENTS IN OR RELATING TO THE PRODUCTION OF SINTERED MATRICES USED IN ALKALINE 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)

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 KANDADY VENKATAKRISHNA UDUPA, Director, PENNAGARAM VYASA RAO VASUDEVA RAO, Scientist and PREMA RANGARATH, Senior Laboratory Assistant, all of the Central Electrochemical Research Institute, Karaikudi-6, Tamil Nadu, India, all Indian citizens.

PRICE Rs.2.00

This invention relates to improvements in or relating to the production of sintered matrices used in alkaline batteries.

Hitherto it was proposed to produce sintered matrices for alkaline batteries by sintering nickel powder alone of particular grade say for instance carbonyl nickel powder of grade F variety, at suitable temperature in a hydrogen or cracked ammonia or any other suitable atmosphere.

This is open to objection that this requires nickel powder of particular grade, and the use of nickel alone increases the cost as all the requirements of nickel are imported.

The main object of the invention is to obviate these difficulties.

We have found that this can be done by the use of composite nickel powder prepared by the process covered by our co-pending Indian Patent application No.747/72 (Serial No.137763) either alone or in admixture with other metal powders for sintering to a nickel, nickel plated steel suitably perforated sheet or wire net. The sintered matrices (plaques) obtained are found to be comparable to the ones obtained with nickel powder alone.

According to the present invention, there is provided a process for the production of sintered matrices suitable for use in alkaline batteries by pressing pure nickel powder, and sintering the pressed green in an atmosphere of dissociated ammonia or hydrogen characterised in that composite nickel powder prepared according to the process of our prior Indian patent No.137763 (747/72) is thoroughly admixed with the pure nickel powder, e.g., in the ratio of 0.2 to 2 by weight, prior to pressing and sintering.

The composite nickel powder admixed with pure nickel powder is sifted over nickel, nickel plated steel or wire mesh or nickel plated punched steel strips, and pressed to obtain a pressed compact.

A pressure of 0.5 to 5 tons/sq.cm. may be used for pressing the mixed powders, preferably at a pressure of 1.5 tons per sq.cm.

Sintering may be effected between 900 to 1000°C and preferably at 930°C.

Thus, the composite powder may be admixed with pure nickel powder preferably carbonyl nickel powder in the ratio of 0.2 to 2 by weight.

Equal proportions of composite and pure nickel powder are preferably employed, when a core material of titanium oxide is used for the preparation of composite nickel powder.

Pure nickel used is preferably 0.3 by weight of the composite powder when the composite powder is produced with the core material of graphite powder.

The composite nickel powder admixed with pure nickel powder is sifted over nickel, nickel plated steel or wire mesh or nickel plated punched steel strips, and pressed to obtain a pressed compact.

The composite and pure nickel powder are mixed and blended thoroughly in a suitable mixing machine so that the mixed powder obtained is uniform and no segregation occurs.

The mixed powder is sifted over a nickel plated steel mesh, or nickel plated punched steel strips or a supporting substrate, and then pressed so that a compact is obtained which can be handled without the pressed

material disintegrating. The pressure used for such a pressing is between 0.5 to 2T/cm^2 and preferably 1.5T/cm^2. The pressed material is then kept over graphite supports and introduced in a furnace under an atmosphere of hydrogen or dissociated ammonia and sintered at a temperature between 900 to 1000°C preferably at 950°C.

The time for such a sintering is between 10 minutes to 1 hour preferably for 30 minutes.

The resistivity of the sintered compact was 30 x 10^{-6} OHM Cm compared to around 20 x 10^{-6} OHM Cm for pure nickel. The porosity of the sintered compact was 66% compared to 65% obtained for sintered matrices obtained for pure nickel. The sintered matrices obtained with a mixture of composite nickel powder and pure nickel powder was found to be as resistant to chemical attack, as well as comparable in electrochemical properties to pure nickel in 30% potassium hydroxide which is usually used as the electrolyte in alkaline batteries.

The sintered matrices obtained with composite nickel powder exhibits the same chain like structure as that obtained from pure carbonyl nickel powder used in the conventional methods.

The savings in nickel by use of a mixture of composite and pure nickel powder amounts to 35 to 50% by weight.

Example-I

Core material of the composite powder	..	Titanium oxide
Carbonyl nickel powder	..	75 micron (-200 mesh)
Pressure	..	2T/cm^2
Ratio of composite to pure nickel powder	..	1:1
Sintering temperature	..	930°C
Atmosphere	..	Cracked ammonia
Duration of sintering	..	30 mts.
Porosity of the sintered matrices	..	66%
Resistivity	..	30.2 x 10^{-6} OHM Cm.

Example-II

Core material of the composite powder	..	Graphite powder 106 micron (-150 mesh)
Carbonyl nickel powder	..	75 micron (-200 mesh)
Pressure	..	$0.5T/cm^2$
Ratio of composite to pure nickel powder	..	1:2
Sintering temperature	..	950°C
Atmosphere	..	Cracked Ammonia
Duration of sintering	..	20 minutes
Porosity of the sintered matrices	..	77%
Resistivity	..	22×10^{-6} OHM Cm.

The invention describes the manner in which the composite nickel powder produced according to Indian Patent No. (137763C) 747/72) is admixed with pure nickel powder and sintered to obtain matrices suitable for use in sintered nickel cadmium batteries and comparable to matrices obtained with pure nickel powder thereby accounting for a saving of 30 to 50% in the consumption of nickel powder. Composite nickel powder prepared in a manner described in Indian Patent No. (137763C) 747/72), is admixed with pure carbonyl nickel powder in a ratio varying between 0.2 to 2 by weight and sifted over a nickel, nickel plated steel, woven or punched strips and pressed in a press at a pressure of 0.5 to $2T/cm^2$ and sintered in a furnace in an atmosphere of hydrogen or dissociator ammonia at a temperature between 900 to 1000°C to obtain sintered matrices with properties similar to the ones obtained with pure nickel powder.

The main advantage of this invention are (1) the consumption of nickel powder is brought down to 65 to 50% for producing sintered plates for alkaline batteries (2) since the core material is of low apparent density the weight of the sintered matrices are lower than that with pure nickel without deterioration in the other properties.

We claim:

1. A process for the production of sintered matrices suitable for use in alkaline batteries by pressing pure nickel powder, and sintering the pressed green in an atmosphere of dissociated ammonia or hydrogen characterised in that composite nickel powder prepared according to the process of our prior Indian Patent No.137763 (747/72) is thoroughly admixed with the pure nickel powder, e.g., in the ratio of 0.2 to 2 by weight, prior to pressing and sintering.

2. A process as claimed in claim 1 wherein the composite nickel powder admixed with pure nickel powder is sifted over nickel, nickel plated steel or wire mesh or nickel plated punched steel stripe, and pressed to obtain a pressed compact.

3. A process as claimed in claim 2 wherein a pressure of 0.5 to 5 tons/sq.cm. is used for pressing the mixed powders, preferably at a pressure of 1.5 tons per sq.cm.

4. A process as claimed in claim 1 wherein sintering is effected between 900 to 1000°C and preferably at 930°C.

5. A process as claimed in claim 1 wherein the composite powder is admixed with pure nickel powder preferably carbonyl nickel powder in the ratio of 0.2 to 2 by weight.

6. A process as claimed in claim 5 wherein equal proportions of composite and pure nickel powder are employed, when a core material of titanium oxide is used for the preparation of composite nickel powder.

7. A process as claimed in claim 5 wherein pure nickel used is 0.3 by weight of the composite powder when the composite powder is produced with the core material of graphite powder.

8. A process for the manufacture of sintered matrices for alkaline batteries substantially as herein before described

Dated this 15th day of July, 1975

JEPP/(C.P & D.C.I)/79-80/150

R Bhaskara Rai
Patents Officer
Council of Scientific and Industrial Research