Government of India, The Patent Office, 214, Acharya Jagadish Bose Road, Calcutta-17. Complete specification No.142687 dated 4th May 1976. Application and Provisional specification No.: 914/Cal/1975 dated 8th May 1975. Acceptance of the complete specification advertised on 14th January 1978.

Index at acceptance - 79c2+c4 [LVIII(5)].

International classification - C 22 d 3/20

"A NEW METHOD FOR THE PRODUCTION OF MASTER ALLOY OF ALUMINIUM-MAGNESIUM"

COUNCIL OF SCIENTIFIC & INDUSTRIAL RESEARCH, Rafi Marg, New Delhi-1, India, an Indian registered body incorporated under ~~an~~ the ~~Registration~~ Registration of Societies Act (Act XXI of 1860).

The following specification describes the nature of this inven.

This is an invention by KUPPUSWAMI VENUGOPALAN, Scientist, VEERARAGHAVA ARAVAMUTHAN, Scientist, MOHAMED KAMALUDEEN, Senior Scientific Assistant, NEDUMARAN GOPALAN RANGANATHAN, Junior Scientific Assistant, all from Central Electrochemical Research Institute, Karaikudi-623 006, Tamil Nadu, India, all Indians.

This invention relates to a new method for the production of master alloys of aluminium-magnesium

It would help in the improvement of the existing process as it eliminates the need for magnesium metal production and separately melting constitutents viz., magnesium and aliminium under suitable flux. It is easier to prepare aluminium-magnesium alloys by this method than by mixing the components which must take into account the difference in densities between the two metals while preparing the alloy and the likely loss to occur due to oxidation and surface rising of magnesium in the conventional method.

The object of this invention is to discharge magnesium ions on to a molten cathode of aluminium from an anhydrous magnesium chloride containing bath such as by-product anhydrous magnesium chloride or from dehydrated carnallite.

To these ends, the invention broadly consists in utilising anhydrous magnesium chloride as electrolyte in

combination with potassium chloride employing molten aluminium as cathode and graphite as anode in a simple non-diaphragm electrolytic cell heated internally and the temperature being also maintained by the passage of electricity.

The following examples serve to illustrate the invention.

Example 1

Electrolyte	$KCL+MgCl_2$
Ratio	1:1
Amperage	300
Voltage	10-11V
Duration of electrolysis	4 hours
Temperature	700-750°C
Wt.of aluminium taken	1.5 kg
Magnesium percentage of alloy	26%
Current efficiency	82%
Wt.of alloy obtained	1.7 kg

Example 2

Electrolyte	$KC1+MgC1_2$
Ratio	1:1
Amperage	300
Voltage	10-11V
Duration of electrolysis	7 hours
Wt.of aluminium taken	2 kg
Temperature	700-750°C
Magnesium percentage of alloy	31%
Current efficiency	87.9%
Wt.of alloy obtained	2.7kg

Example 3

Electrolyte	$KC1+MgC1_2$
Ratio	1:1
Amperage	300
Voltage	10-11V
Duration of electrolysis	7 hours
Temperature	700-750°C
Wt.of alluminium taken	2 kg

Magnesium percentage of alloy	34%
Current efficiency	89.26%
Wt. of alloy obtained	2.85 kg

In all the above experiments the percentage of magnesium was estimated by analysis and some alloy was lost during collection from the cell.

The following are the main advantages of the invention:-

A new method for the production of master alloy has been invented by discharging magnesium metal from anhydrous magnesium chloride containing electrolyte on to molten aluminium in fused salt bath.

Dated this 27th day of April 1975

sd/-

Asst.Patents Officer

Council of Scientific & Industrial Research

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THE PATENT ACT 1970

COMPLETE SPECIFICATION

SECTION 10

"A NEW METHOD FOR THE PRODUCTION OF MASTER ALLOY OF ALUMINIUM MAGNESIUM"

COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH, Rafi Marg, New Delhi-1, Indian, 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 KUPPUSWAMY VENUGOPALAN, Scientist, VEERARAGHAVA ARAVA MUTHAN, Scientist, MOHAMAD KAMALUDEEN, Senior Scientific Assistant and NEDUMARAM GOPALAN RANGANATHAN, Junior Scientific Assistant, all of the Central Electrochemical Research Insitute, Karaikudi-623006, Tamil Nadu, India, all Indian citizens.

The invention relates to production of master alloy of aluminium-magnesium which is useful in the aluminium foundries as well as in pyrotechnic works. Aluminium-magnesium alloy is also used in the construction of equipment suitable for desalination of sea water.

Hitherto the master alloy has been prepared by direct combination of the respective metal viz. , aluminium and magnesium by combining them under proper condition of temperature under suitable flux. There is not method available for the preparation of the master alloy as the present invented method.

Drawbacks connected with hitherto known processes/devices

The invented method would help in the improvement of the existing process as it eliminates the need for magnesium metal production and separately melting constitutents viz., magnesium and aluminium under suitable flux. It is easier to prepare aluminium-magnesium alloy by this method than by mixing the components which must take into account the difference in densities between the two metals while preparing the alloy and loss likely to occur due to oxidation and surface rising of magnesium in the conventional method.

The main object is to prepare the master alloy of aluminium-magnesium by fused salt electrolysis.

The main principle involved in the invention is the discharge of magnesium ions on to a molten cathode of aluminium from a bath containing anhydrous magnesium chloride.

The new result flowing from the new finding:

By the electrolytic method it was possible to prepare the master alloy of aluminium-magnesium with a maximum magnesium content of 33-35%.

The present invention consists of a process for the preparation of master alloy of aluminium-magnesium which comprises the use of molten aluminium metal as cathode, suitable composition (1:1 by weight) of anhydrous magnesium chloride, potassium chloride electrolyte with graphite anode electrode, wherein the magnesium ion from the anhydrous magnesium chloride gets discharged on to the molten cathode of aluminium, to form the master alloy of aluminium-magnesium (33 to 35% magnesium) and employing cathode current density of 100 amp/sq.dm., and anode current density of 400 amps/sq.d., at 700-750°C.

Flow sheet of the process is attached.

A few typical examples to illustrate how the invention is carried out in actual practice:

Example 1

Electrolyte	...	$KCl + MgCl_2$
Ratio	...	1:1 by weight
Amperage	...	300 amps
Voltage	...	10-11 V
Duration of electrolysis	...	4 hours
Temperature	...	700-750°C
Weight of aluminium taken	...	1.5 kg
Magnesium percentage of alloy	...	26%
Current efficiency	...	82%
Weight of alloy obtained	...	1.7 kg
Current density cathode	...	100 amp/sq.dm.
" " anode	...	400 amp/sq.dm.

Example 2

Electrolyte	...	$KCl + MgCl_2$
Ratio	...	1:1 by weight
Amperage	...	300 amps
Voltage	...	10-11 V
Duration of electrolysis	...	7 hours
Weight of aluminium taken	...	2 kg
Temperature	...	700-750°C
Magnesium percentage of alloy	...	31%
Current efficiency	...	2.7 kg
Weight of alloy obtained	...	2.7 kg
Current density cathode	...	100 amp/sq.dm.
" " anode	...	400 amp/sq.dm.

Example 3

Electrolyte	...	$KCl + MgCl_2$
Ratio	...	1:1 by weight
Amperage	...	300 amps
Voltage	...	10-11 V
Duration of electrolysis		8 hours

Temperature	...	700-750°C
Weight of aluminium taken		2 kg
Magnesium percentage of alloy		34%
Current efficiency		89.26%
Weight of alloy obtained		2.85 kg
Current density cathode		100 amp/sq.dm.
" " anode		400 amp/sq.dm.

In all the above experiments the percentage of magnesium was estimated by analysis and some alloy was lost during collection from the cell.

The main advantage of the invention is that a master alloy of aluminium-magnesium containing 33-35% magnesium could easily be prepared by the electrolytic method of discharging magnesium ion on to molten aluminium cathode. This overcomes the difficulties of oxidation and reaction of nitrogen on the magnesium due to density differences and surface rising of magnesium which are normally expected in the conventional method. Considerable magnesium loss which has been normally observed in preparing aluminium-magnesium alloy containing above 10% magnesium in the conventional method has also been avoided in this new method.

We claim:-

1. A process for the production of master alloy of magnesium aluminium containing a maximum of 33-35% magnesium metal which consists in discharging magnesium ion on to molten aluminium cathode from a fused salt electrolyte containing 1:1 weight ratio of magnesium-potassium chloride at 700 to 750°C and current density (cath 100 amp/sq.dm., and anode 400 amp/sq.dm.), carbon/graphite anode sucking of chlorine to obtain the desired product.

2. A process for the production of master alloy of magnesium-aluminium substantially as herein before described.

Dated this 28th day of April, 1976.

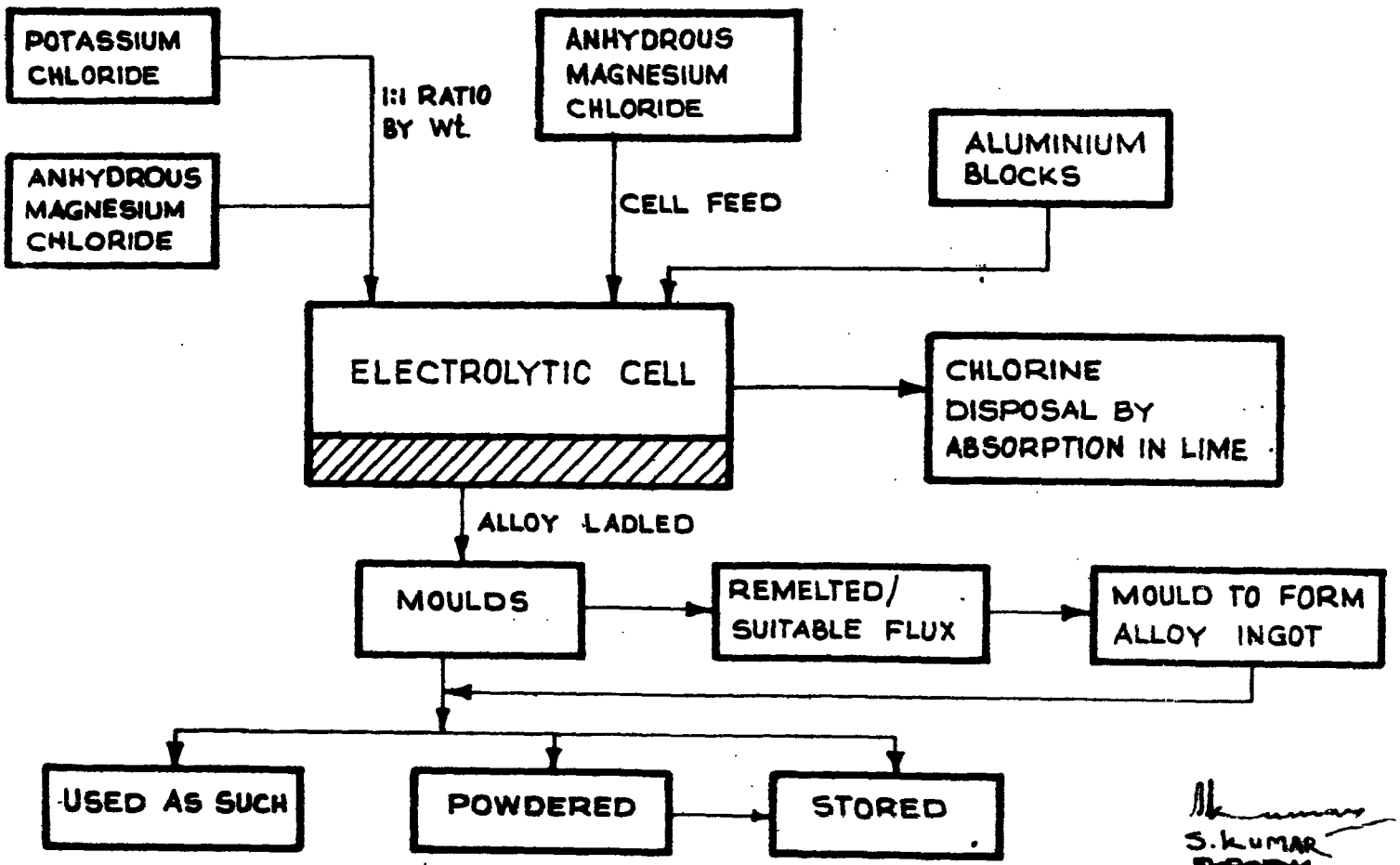
Patents Officer,
Council of Scientific and Industrial Research.

COUNCIL OF SCIENTIFIC & INDUSTRIAL RESEARCH.

No 142 587

№ OF SHEETS:- 1
SHEET № :- 1

FLOW SHEET FOR THE PREPARATION OF MASTER ALLOY OF ALUMINIUM-MAGNESIUM



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