

ALIEN PROPERTY CUSTODIAN

METHOD OF ELECTROLYTICALLY OBTAINING MAGNESIUM

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The present invention relates to a method of electrolytically obtaining magnesium.

In obtaining magnesium by a molten metal electrolysis of a salt mixture containing chloride of magnesium, usually carnallite, a mineral consisting of chloride of potassium and chloride of magnesium, the separated magnesium, due to its low specific weight, rises to the upper surface of the bath. The danger then exists of recombining with the simultaneously separated chlorine at the anode, or of absorption of other substances. The raw magnesium so produced usually must subsequently be subjected to a purifying method. The necessity of separately collecting the products rising from both electrodes requires the use of special apparatus which at the operating temperatures of 7-800° C. are rather complicated and expensive. If, without substantially increasing the operating costs, it is possible to separate the magnesium at the bottom of the electrolyzing cell not only the total structure of the operating cell would be substantially simplified and its manufacturing costs reduced, but the separated metal would be purer and of higher value. By using a cathode of a special heavier metal or an alloy which is liquid at the operating temperature and sufficiently tends to solve with regard to magnesium, such as lead, aluminium etc., it is well known to absorb the magnesium in this bottom metal and then either to separate it again in a second operating phase or to directly use the alloy produced. When using aluminium or aluminium-magnesium-alloys respectively as cathode the enrichment of magnesium is limited, because with an increase of the magnesium contents the density of this alloy approaches that of the carnallite melt and the danger of floating or rising respectively exists. It is evident to obviate this draw-back by adding to the melt substances which are specifically light and harmless for carrying out the electrolysis. Such substances particularly proposed for this purpose are chloride of potassium and chloride of magnesium respectively.

A mixture of chloride of potassium and chloride of magnesium having a temperature of 750° C. has the same density than liquid magnesium if the contents of chloride of potassium in the melt amount to 80%. For maintaining a sufficient density difference of at least 90% of chlo-

ride of potassium of a temperature of 750° C. must be maintained. At a lower temperature the necessary minimum concentration in chloride of potassium is correspondingly higher, because the chlorides have a greater temperature coefficient for the change in density than the magnesium. The low concentration of chloride of magnesium then excludes an electrolysis at the economically desirable high current densities; the higher operating temperature causes disturbances due to the then already perceptible vapor pressure of the magnesium (of about 25 mm. Hg) so that this proposal could not lead to a practical use. The use of sodium chloride has similar effects but in this case the separation of the sodium cannot be prevented due to the lower decomposition tension. For the same reason the very light lithium chloride has been considered as useless in the literature.

Now, it has been found that in contradistinction to this hitherto prevailing point of view lithium chloride is excellently useful. If it is desired for instance to obtain pure magnesium from a melt, containing 30% chloride of magnesium, 40% chloride of potassium and 30% chloride of lithium, the temperature of the bath is maintained within 670 to 720° C. The magnesium then separated contains no potassium and at the most traces of lithium and, moreover, is free of non-metallic admixtures.

Without danger the composition of the melt bath may be varied within large limits. Care only must be taken that the density of the melt at the selected operating temperature lies sufficiently below that of the molten magnesium. Of course, the impoverishment of chloride of magnesium must not be too large particularly not at the higher current densities. Even with 10% of chloride of magnesium and 50% of chloride of lithium only no higher lithium content in the separated magnesium was ascertained.

To prevent foreign substances mechanically entered into the bath or heavier oxides and the like formed during melting to enter the metal of the cathode or to reach the upper surface of the latter, the melt preferably is completely purified and cleared in a suitable manner before the electrolytic decomposition starts.

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