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FLUX FOR USE IN THE TREATMENT OF LIGHT METAL

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2 Claims. (Cl. 75—67)

This invention relates to fluxes for use in the melting of light metals consisting of magnesium metal, magnesium base alloys and aluminium-magnesium alloys, all referred to hereinafter as "metal."

As is well known, considerable oxidation of the metal can occur in contact with air when the metal is being melted or is in the molten state. The metal also reacts with the nitrogen in the air with formation of nitrides.

The losses of metal which are thus caused and the inclusion of reaction products such as oxides and nitrides as impurities in the metal can be minimized by the use of a flux.

Two main kinds of flux have heretofore been proposed, viz:

(a) A thinly fluid or non-inspissated flux of low melting point such as carnallite (see for example the specification of the applicant company's Patent No. 469,347) which is more particularly intended merely for protecting the metal against oxidation, and

(b) The use of an inspissated flux which was originally described in the specification of the applicant company's Patent No. 219,287, and is more particularly intended for refining the metal as well as for preventing oxidation.

The object of the present invention is to provide an improved flux of the thinly fluid type (a).

The desirable properties of such a flux are:

1. It should have a low melting point, so that it will melt and cover the surface of the metal at the lowest possible temperature and well below the melting point of the metal.

2. It should have a low surface tension and good wetting properties, so that it will quickly and completely cover the metal surface.

3. It should give a thinly fluid melt, i. e. possess a low viscosity, and therefore should not contain such a proportion of inspissating agents (such as magnesium oxide and calcium fluoride) as will have an appreciable inspissating effect.

4. It should be a free flowing powder at ordinary temperatures, and of such a degree of fineness that it may readily, uniformly and economically be distributed over the metal surface in the powder form.

5. It should be readily removable from the metal when melting is complete, in order not to be retained as an impurity in the metal when cast, with consequent adverse effect on the mechanical properties and corrosion resistance. For this purpose it should be capable of being readily inspissated by the addition to the melt of inspissating agents or an inspissated flux.

6. It should not react chemically with the metal, to give impurities which will have an adverse effect on the properties of castings made therefrom.

7. It should be stable in use so that, for example, losses by evaporation or chemical reaction do not modify its effect.

We have, by systematic investigation of numerous compositions of flux in relation to each of these requirements, found that they are most satisfactorily fulfilled by mixtures of chlorides of magnesium, calcium, sodium and potassium and preferably also a small proportion of magnesium oxide. Consistently good results are obtained within the following range of composition:

	Per cent
Magnesium chloride	20–50
Calcium chloride	25–40
Sodium chloride	[1]Up to 30
Potassium chloride	[1]Up to 30
Magnesium oxide	0– 5

[1] Together within the limits 20–25%.

The composition of one flux which has given particularly good results is:

	Per cent
Magnesium chloride	34
Calcium chloride	30
Sodium chloride / Potassium chloride	35
Magnesium oxide	1

In general, we find that the best results are obtained within a range of plus or minus 5% of each constituent of this composition.

We find that with the use of this flux, the flux consumption is low and losses of metal by oxidation during melting are reduced to very small proportions.

In preparing the flux, we have melted the constituents together and ground them to a powder of suitable fineness or we have mixed the constituent materials and then ground them or we have ground the materials separately and then mixed them. There is no considerable difference in efficiency discernible between these methods. We normally grind the flux to produce a powder which all passes through a 10 mesh B. S. sieve and not more than 20% passes through a 200 mesh B. S. sieve.

The flux, according to the present invention, can be used in dealing with both virgin metal and scrap. As an example of a method of using the flux, we will now describe the use of the flux in connection wth the re-melting and refining of virgin metal.

Into a hot cast steel pot, gas heated externally, were placed 2,285 kgs. raw magnesium blocks as obtained directly from electrolytic cells and containing entrained metallic chlorides to the average extent of about 0.1–0.5% chloride ion. The contents of the pot were dusted over with a flux of the following composition:

	Per cent
Magnesium chloride	34
Calcium chloride	30
Sodium and potassium chlorides	35
Magnesium oxide	1

As melting proceeded, more flux of the same composition was added to control burning of the metal; in all 15 kgs. of the fluid flux was used. When melting was complete, heating was continued until the contents of the pot had been brought to a temperature of 745° C. whereupon the metal was agitated by "plunging" with an iron tool. The molten metal was then treated with 7.25 kgs. of the flux of the following composition:

	Per cent
Magnesium chloride	37
Calcium chloride	14
Sodium and potassium chlorides	15
Magnesium oxide	13
Calcium fluoride	21

This quantity of flux was applied in the following manner:

A portion of the flux was stirred into the metal by "plunging" as above and then the remainder was sprinkled uniformly over the surface to form a protective cover and the metal allowed to stand and cool to 720° C. whereupon it was poured into ingots. The yield thus obtained was 2,196 kgs. (96.1% melting efficiency) of metal containing 0.005% chloride ion. In other tests up to and even over 98% melting efficiency has been obtained.

From the metal thus prepared, alloys according to D. T. D. specifications were manufactured and test specimens from these batches showed a corrosion resistance and mechanical properties which were at least as good as such alloys as heretofore produced. In producing such alloys, the purified magnesium was remelted and alloyed with the aid of the fluid flux, the melt was then further protected by means of the inspissated flux and the usual superheating and settling processes, where necessary, were carried out in accordance with applicant company's Patents Nos. 359,425 and 336,498.

We claim:

1. A flux for use with metal of the kind hereinbefore defined consisting of at least 95% of the following substances in the amounts specified:

	Per cent
Magnesium chloride	20–50
Calcium chloride	25–40
Sodium chloride	Up to 30
Potassium chloride	Up to 30
Magnesium oxide	0–5

the sodium chloride and potassium chloride together amounting to between 20 and 50%.

2. A flux for use with metal of the kind hereinbefore defined having the following composition:

	Per cent
Magnesium chloride	31–37
Calcium chloride	27–33
Sodium chloride / Potassium chloride	32–38
Magnesium oxide	.05–4

the total of these ingredients amounting to at least 95%.

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