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PROCESS FOR THE REDUCTION OF SILICATES OTHER THAN ALKALINE EARTH METAL SILICATES AND THE PRODUCTION OF ALLOYS OF ALUMINIUM

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2 Claims. (Cl. 75—27)

In the specification of my prior application Serial No. 620,574 which matured into Patent No. 1,935,245, a process is described for the manufacture of alkaline earth alloys of aluminium which comprises the steps of heating in a molten bath of aluminium, below the surface thereof, an oxygen containing compound, inter alia a silicate, of the alkaline earth metal whereby a molten alloy and an infusible dross containing alumina are formed; and thereafter separating the molten portion from the infusible dross.

By this process a considerable and sometimes predominating portion of the alkaline earth-aluminium alloy remains in the heating chamber (crucible) along with alumina (Al_2O_3) in the form of dross and the process includes the treatment of the dross for the recovery of valuable constituents therefrom by melting it down with a reagent capable of forming a salt with the alkaline earth constituent of the alloy therein (for example, common salt).

In the treatment of alkaline earth silicates by the prior process above referred to, the silicate is reduced and alloys with aluminium producing either:—

(*a*) An aluminium-silicon alloy and leaving the alkaline earth metal oxide together with aluminium oxide in the dross which forms; or

(*b*) An aluminium-silicon-alkaline earth metal alloy according to the nature of the alkaline earth silicate selected.

Further investigation has now shown that other natural silicates may be treated in the same way as alkaline earth silicates so that the silicate is reduced and an aluminium-silicon alloy is obtained.

The present invention therefore is for a process for the manufacture of aluminium-silicon alloys which comprises the steps of heating in a molten bath of aluminium below the surface thereof, a natural silicate other than an alkaline earth silicate, whereby a molten alloy and an infusible dross containing alumina are formed, and thereafter separating the molten portion from the dross. Thus, for example, china clay or other clays consisting mainly of aluminium silicate when treated by the process of the invention produce an aluminium silicon alloy and the resulting dross consists substantially of pure aluminium oxide. Other aluminium silicates such as andalusite, leucite, sillimanite and the various forms of feldspar may be used as raw material. In this way the process of the invention provides a ready means of producing pure aluminium oxide from complex silicates in one furnace operation, instead of the cumbersome wet method ordinarily employed. In each case a useful high grade aluminium-silicon alloy is formed and a substantially pure aluminium oxide which may be used as raw material in the manufacture of metallic aluminium.

Furthermore, manganese-aluminium silicon alloys can be produced directly by the process of the invention by employing manganese silicates as raw material and other silicon aluminium alloys may be similarly produced by employing as raw material the respective metal silicate in the process of the invention.

The silicate must be added to the molten bath of aluminium in pieces of sufficient size to overcome the surface tension of the molten aluminium and sink below the surface of the bath. For this purpose pieces or grains of a size ranging between 1 or 2 mm. up to 100 mm. or more may be added at the surface of the bath. The amount added will depend upon the composition of the silicate added and the amount of silicon required in the alloy to be produced, but in calculating this the amount of aluminium which is converted into alumina dross in the reduction of the silicate, will have to be taken into account. The temperature will also depend upon the melting point of the alloy to be produced.

What I claim is:—

1. A process for the manufacture of aluminium-silicon alloys which comprises the steps of heating china clay in a molten bath of aluminium, below the surface thereof, without the addition of fluxes or materials which will form molten fluxes or slags while the aluminium is in substantial excess of that required to combine with the oxygen of the added material, thereby to form a molten aluminium-silicon alloy and an infusible dross containing alumina, and thereafter separating the molten alloy from the infusible dross.

2. A process for the manufacture of aluminium-silicon alloys which comprises the steps of heating in a molten bath of aluminium an aluminium silicate in solid pieces of sufficient size to overcome the surface tension of the molten aluminium and thereby sink below the surface of the bath, without the addition of fluxes or materials which will form molten fluxes or slags, the aluminium being in substantial excess of that required to combine with the oxygen of the added material, whereby a molten aluminium silicon alloy and a dross containing alumina are formed, and thereafter separating the alloy and the dross.

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