This invention is based in the field of ferrous metallurgy and relates specifically to a process for producing uniform and homogeneous alloys of iron and aluminum containing substantial quantities of aluminum. This invention is related to an invention entitled Preparation of Iron Aluminum Alloys which is described and claimed in United States Letters Patent 2,804,387, issued August 27, 1957.

In the production of iron aluminum alloys comprising substantial amounts of aluminum difficulty is experienced in producing a homogeneous melt and in avoiding refractory difficulties occasioned by the exothermic solution of aluminum in iron. These difficulties are particularly marked in alloys containing more than 6 percent aluminum.

In United States Letters Patent 2,804,387, mentioned above, will be found a complete description of the method of preparing a completely deoxidized iron bath and completely deoxidized and dehydrogenated aluminum bath.

In the execution of this invention a completely deoxidized bath of molten iron is prepared in any acceptable manner. Similarly, a completely deoxidized and dehydrogenated bath of molten aluminum is established in a ferrous container. This ferrous container holding the molten aluminum is placed within a suitable receptacle, as for example a commercial ladle, and the molten iron is poured in a stream upon the surface of the molten aluminum. The stream of molten iron courses downwardly through the molten aluminum alloying with the aluminum as it descends and then punctures the lower portion of the ferrous container and releases the alloy into the ladle. The ferrous container promptly dissolves in the alloy. The turbulence produced by this procedure results in a homogeneous alloy and the chilling effect of the solid ferrous container prevents disastrous erosion of the refractories by the exothermic heat solution of aluminum in iron.

The following specific examples are given of this invention:

(A-90-X) Two hundred and fifty pounds of ingot iron were melted and deoxidized with 0.75 percent manganese, 0.378 percent aluminum, and 0.08 percent metallic calcium. (The calcium additions were completed in a total of 11 plungings.)

Twenty-five pounds of aluminum were melted, treated with calcium, degassed, covered with flux, and superheated to 1500°F. in a ¼-inch steel container. The container was placed in a preheated ladle, into which ingot iron (3100°F.) was tapped. The steel container disappeared instantly.

(A-91-X) The melt practice in this heat was similar to that in heat A-90-X, except that a ¼-inch steel container was used and the calcium deoxidation of iron was omitted in order to minimize the hazard of spattering of molten iron. Manganese and aluminum additions were raised to 1 percent and 0.5 percent, respectively. The pouring temperature of the iron was lowered to 3000°F., and that of aluminum was 1480°F. at the time of transfer to the ladle. The steel container melted as soon as the molten metal completely surrounded the steel.

(A-92-X) The melt and deoxidation practice in this heat was identical to that in heat A-91-X. The iron and aluminum temperatures, however, were lowered to 2930°F. and 1420°F., respectively. The ¼-inch container dissolved in the same manner as in heat A-91-X.

While this invention is particularly adapted for the production of ductile alloys containing 6 to 18 percent aluminum, as specified in United States Letters Patent 2,804,387, it is not so limited but may be employed whenever it is required to produce homogeneous iron aluminum alloys which are rich in aluminum.

We claim as our invention:

1. The process of producing a homogeneous, ductile, iron aluminum alloy comprising producing a bath of molten iron containing a concentration of aluminum substantially higher than that concentration which corresponds to the equilibrium between calcium and oxygen at the temperature of molten iron, establishing in a ferrous container a substantially hydrogen free bath of molten aluminum containing a concentration of oxygen not substantially higher than that concentration which corresponds to the equilibrium between calcium and oxygen at the temperature of the molten aluminum, placing the ferrous container in a ladle and pouring a stream of the deoxidized molten iron upon the molten aluminum in the ferrous container whereby the ferrous container is dissolved and a homogeneous alloy comprising iron and aluminum is produced.

2. The process of producing a homogeneous, ductile iron aluminum alloy comprising producing a rigidly deoxidized bath of molten iron, establishing in a ferrous container a substantially hydrogen free and rigidly deoxidized bath of molten aluminum, placing the ferrous container in a ladle and pouring a stream of the deoxidized molten iron upon the molten aluminum in the ferrous container whereby the ferrous container is dissolved and a homogeneous alloy comprising iron and aluminum is produced.

3. The process of producing a homogeneous alloy of iron and aluminum containing at least six percent aluminum and controlling the exothermic solution of the aluminum in iron comprising producing a bath of molten iron, establishing in a ferrous container a bath of molten aluminum, placing the ferrous container of molten aluminum in a receptacle and pouring upon the surface of the molten aluminum a stream of molten iron whereby the ferrous container is dissolved and a homogeneous alloy comprising iron and aluminum is produced, the weight of aluminum in the molten aluminum bath being sufficient to substantially elevate the temperature of the iron aluminum mix by exothermic heat of solution of aluminum in iron.

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