

## UNITED STATES PATENT OFFICE

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DESULFURIZATION OF METALS AND  
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4 Claims. (Cl. 75—28)

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The invention relates to a method for the desulphurization of metals and alloys in the solid state.

According to the invention sulphur may be removed from certain metals and alloys by heating such materials in vacuo in the presence of included or added silicon at temperatures below the melting point of the materials. The method of the invention may be used with metals and alloys of the type which have vapor pressures substantially below that of silicon sulphide. Among such metals are those in the same valence groups of the periodic chart of the elements as copper, titanium, vanadium, chromium and iron, the forementioned metals being the lightest members of these groups.

In the solid phase, vacuum decarburization of high-carbon metals and alloys with an oxidant, it is often desirable to effect desulphurization of the decarburized metals and alloys. The method of the invention is particularly suitable for this purpose.

In the practice of the method of the invention in the desulphurization of metals and alloys, silicon should be present in a stoichiometrical amount at least equal to that required to form silicon sulphide with the sulphur to be removed. Silicon is usually volatilized as the monosulphide, but the possible occurrence of the disulphide is not excluded for the purposes of this application. The material to be desulphurized should be in comminuted form to permit the ready escape of expelled silicon sulphide as well as proximity between reacting materials. The comminuted material may, if desired, be compressed into pellets or otherwise bonded together. The heating stage should be conducted in vacuo, or at very low pressures, and at a temperature below the melting point of the materials employed.

The following specific example of the desulphurization of ferrochromium will serve to illustrate the principles and practice of the invention. A mixture of comminuted high-carbon ferrochromium and comminuted oxidized ferrochromium in an amount sufficient to provide an oxygen excess of 18% over that required to combine with the carbon of the ferrochromium was prepared and bonded with chromic acid into pellet form. The pellets were divided into two portions and treated as follows:

Both portions were heated at 1250° C. for 8 hours at an absolute pressure of about one m. m. of mercury. After this treatment each portion was reground and analyzed. Each portion contained 0.08% sulphur. One portion was repel-

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leted without any silicon addition. The other portion was mixed with a quantity of comminuted silicon equal to 4.5% of the weight of the portion and the mixture was repelleted. Both portions were then reheated for an additional 8 hours at 1250° C. at an absolute pressure of about one m. m. of mercury and then cooled and crushed. Analysis of the two portions showed that the silicon-treated material contained only 0.035% sulphur. The other material, which except for the silicon addition, was otherwise treated identically with the first portion, contained 0.06% sulphur.

In this application and in the appended claims whenever the word silicon is used, it is intended to mean the element silicon, which may be added as silicon metal, silicon-bearing alloys, silicides, or metallic silicon from whatever source derived.

What is claimed is:

1. Method for the solid phase desulphurization of ferrochromium which comprises incorporating with said ferrochromium to be desulphurized a quantity of silicon at least equal to that required stoichiometrically to form silicon sulphide with the sulphur to be removed from said ferrochromium; comminuting the material to be treated; and heating said comminuted material at very low subatmospheric pressure and at an elevated temperature sufficient to form silicon sulphide by reaction between the sulphur in said ferrochromium and the silicon incorporated therewith but below the melting point of the material being treated.

2. Method as claimed in claim 1 wherein the comminuted material to be desulphurized is pelleted prior to said heating step.

3. Method for the solid phase desulphurization of high-carbon ferrochromium which comprises incorporating with said high-carbon ferrochromium an oxidant in an amount at least sufficient stoichiometrically to react with the carbon to be removed from said high-carbon ferrochromium and silicon in an amount at least equal to that required stoichiometrically to form silicon sulphide with the sulphur to be removed from said high-carbon ferrochromium; comminuting the material to be treated; and heating said comminuted material at very low subatmospheric pressure and at a temperature sufficient to promote reaction but below the fusion point of the charge.

4. Method as claimed in claim 3 wherein the comminuted material to be desulphurized is pelleted prior to said heating step.

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