PATENT SPECIFICATION

Application Date: March 22, 1937. No. 8333/37. **489,742**

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Complete Specification Accepted: Aug. 3, 1938.

PROVISIONAL SPECIFICATION

Improvements in and relating to the Treatment of Substances containing Tantalum and/or Niobium

I, WILLIAM WARREN TRIGGS, of the firm, Marks & Clerk, of 57 & 58, Lincoln's Inn Fields, London, W.C.2, a British subject, do hereby declare the nature of this invention (a communication to me from abroad by Societe Generale Metallurgique de Hoboken, a Belgian Limited Company, of Hoboken - lez - Anvers, Belgium), to be as follows:—

This invention relates to an improved process for the recovery of tantalum and/or niobium from substances, such as ores or metallurgical by-products, in which the said elements are found in the form of oxide compounds.

It is known to recover the tantalum and/or niobium from their oxides by a reducing operation in the presence of metal elements.

According to the present invention, the reducing metal elements are used in the liquid or molten state.

Calcium and/or aluminium and/or magnesium in the liquid state may be used advantageously as the reducing elements. The invention, however, is not limited to these elements.

When both elements, tantalum and niobium, are present a sufficient amount of the reducing metal in liquid form may be used to reduce them both, or such an amount thereof may be used which is insufficient completely to reduce both the niobium and the tantalum so as to obtain a selective separation of the niobium from the tantalum.

The reducing operation may be effected in any suitable metallurgical apparatus, such as an electric furnace.

The tantalum and/or niobium may be obtained in the form of an alloy with another metal or metals. For instance, iron may be added to the charge or reducing bath either before, or during or after the treatment, so as to obtain directly an alloy of tantalum and/or niobium. The metal which is to form the alloy with the Ta and/or Nb may be added in the oxide form.

The slags or residues or by-products obtained by the reducing operation may be treated with calcium and/or aluminium and/or magnesium in the solid or liquid state with a view to recovering the Ta and/or Nb.

Dated the 22nd day of March, 1937.
MARKS & CLERK.

COMPLETE SPECIFICATION

Improvements in and relating to the Treatment of Substances containing Tantalum and/or Niobium

I, WILLIAM WARREN TRIGGS, of the firm of Marks & Clerk, 57 & 58, Lincoln's Inn Fields, London, W.C.2, a British subject, do hereby declare the nature of this invention (a communication to me from abroad by Societe Generale Metallurgique de Hoboken, a Belgian Limited Company, of Hoboken - lez - Anvers, Belgium), and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to an improved process for the recovery of tantalum and/or niobium from substances, such as ores or metallurgical by-products, in which the said elements are found in the form of oxide compounds.

It is known to recover the tantalum and/or niobium from their oxides by a reducing operation in the presence of metal elements.

According to the present invention, the reducing metal elements are in the liquid or molten state when introduced into the reaction vessel.

Calcium and/or aluminium and/or magnesium in the liquid state may be used advantageously as the reducing elements. The invention, however, is not

limited to these elements.

When both elements, tantalum and niobium, are present a sufficient amount of the reducing metal in liquid form may be used to reduce them both, or such an amount thereof may be used which is insufficient completely to reduce both the niobium and the tantalum so as to obtain a selective separation of the niobium from the tantalum.

The reducing operation may be effected in any suitable metallurgical apparatus, such as an electric furnace and the reducing metal or metals which has or have been molten in an outside vessel are poured into the said metallurgical apparatus.

The tantalum and/or niobium may be obtained in the form of an alloy with another metal or metals. For instance, iron may be added to the charge or reducing bath either before, or during or after the treatment, so as to obtain directly an alloy of tantalum and/or niobium. The metal which is to form the alloy with the Ta and/or Nb may be added in the oxide form.

The treatment is preferably carried out in an electric furnace with application of external heat before and after the introduction of liquid reducing agent into the furnace.

The present process offers serious advantages over the known processes in which reducing metals in the solid state are introduced into the reaction vessel. Indeed, the addition of reducing metal in the molten state allows of obtaining a much higher heat evolution, and therefore temperature, than the said known processes. This may be explained by the fact that the heat required for melting the reducing metal has already been supplied by an outside source. Also, the addition of reducing metal may be effected during a relatively short time, so that a high concentration of the heat evolved by the exothermal reaction may be obtained. Under these conditions, the addition of flux for the formation of the slag may be reduced to a large extent, with consequent smaller losses of Ta and Nb. Also, the present invention requires a smaller amount of reducing metal than the known processes with solid reducing metal, an appreciable excess of reducing metal being required in these last processes.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. A process of treatment of substances containing tantalum and/or niobium in oxide form, in which tantalum and/or niobium are recovered from their oxides by means of a reducing operation with metal reducing element or elements, characterized in that the metal reducing element or elements is or are in liquid or molten form when introduced into the reaction vessel.

2. A process as claimed in claim 1, characterized by the use of liquid calcium and/or aluminium and/or magnesium as the reducing elements.

3. A process as claimed in claim 1 or 2, characterized in that the liquid reducing agents are used in an amount such as to obtain a selective separation of niobium from tantalum.

4. A process as claimed in any of the preceding claims characterized in that the tantalum and/or niobium are obtained in the form of ferro-alloys.

5. A process as claimed in claim 1, 2, 3, or 4, characterized in that the treatment is carried out in an electric furnace with application of external heat before and after the introduction of liquid reducing agent into the furnace.

Dated this 21st day of February 1938.

MARKS & CLERK.

Leamington Spa: Printed for His Majesty's Stationery Office, by the Courier Press.—1938.

limited to these elements.

When both elements, tantalum and niobium, are present a sufficient amount of the reducing metal in liquid form may be used to reduce them both, or such an amount thereof may be used which is insufficient completely to reduce both the niobium and the tantalum so as to obtain a selective separation of the niobium from the tantalum.

The reducing operation may be effected in any suitable metallurgical apparatus, such as an electric furnace and the reducing metal or metals which has or have been molten in an outside vessel are poured into the said metallurgical apparatus.

The tantalum and/or niobium may be obtained in the form of an alloy with another metal or metals. For instance, iron may be added to the charge or reducing bath either before, or during or after the treatment, so as to obtain directly an alloy of tantalum and/or niobium. The metal which is to form the alloy with the Ta and/or Nb may be added in the oxide form.

The treatment is preferably carried out in an electric furnace with application of external heat before and after the introduction of liquid reducing agent into the furnace.

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2. A process as claimed in claim 1, characterized by the use of liquid calcium and/or aluminium and/or magnesium as the reducing elements.

3. A process as claimed in claim 1 or 2, characterized in that the liquid reducing agents are used in an amount such as to obtain a selective separation of niobium from tantalum.

4. A process as claimed in any of the preceding claims characterized in that the tantalum and/or niobium are obtained in the form of ferro-alloys.

5. A process as claimed in claim 1, 2, 3, or 4, characterized in that the treatment is carried out in an electric furnace with application of external heat before and after the introduction of liquid reducing agent into the furnace.

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