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CONTAINER FOR HIGH PURITY METALS

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2 Claims. (Cl. 206—84)

This invention relates to the purification of certain metals and also relates to an apparatus for maintaining a low impurity level in certain metals.

The hardness and ductility of metals are generally dependent upon their impurity content in addition to the inherent properties of the metals themselves. It would be greatly advantageous to purify certain metals, such as chromium and vanadium, thereby rendering them softer and occasionally more ductile than they are presently available. Such improved ductility and softness will facilitate drawing, extruding, machining, and molding of such metals into desired shapes.

It is, therefore, the primary object of the subject invention to provide a material suitable for use as a container in which metals of the above-disclosed group, and, in particular, chromium, may be substantially purified without the introduction of other impurities which would have a detrimental effect on the metal.

It is a further object of this invention to provide such a container wherein the purified metal may be stored without substantially increasing the impurity level thereof.

In accord with and fulfilling the above-mentioned objects this invention comprises a container made of cerium monosulfide. In another aspect of this invention it comprises a container of any refractory material having the internal portion thereof coated with cerium monosulfide. It is important in the practice of this invention that either of the two containers above-specified be maintained in a non-oxidizing inert atmosphere during the time that a metal to be purified or a stored purified metal is contained therein. Such an atmosphere may be provided by evacuating a container or by blanketing it with an inert gas such as helium or argon.

In particular, the containers of this invention are applicable to use with chromium, vanadium, alloys of chromium and alloys of vanadium. In the use of the container of this invention with any of these metals it has been found that if the impure metal is heated to above its melting point in this container and agitated therein a significant reduction in impurity level occurs. It has further been noted that if a purified metal is kept in such a container the impurity level does not substantially increase.

As specific examples of the practice of this invention, chromium has been purified by heating it in a cerium monosulfide crucible to various temperatures between 50° C. and 150° C. above its melting point for periods of from 5 to 32 minutes, under an argon atmosphere. The results of these test runs appear in summary form in Table A below.

TABLE A

Chromium Melted in CeS

	Run I	Run II	Run III
Superheat, ° C. above melting point	50	75	140
Duration, Minutes	30	32	5
Helium Pressure, mm. Hg	380	380	100
Surface Appearance	(1)	(2)	(3)

CHEMICAL ANALYSIS

Impurity	Before Purification	Run I	Run II	Run III
O_2 wt. percent	0.28	nil	0.079	0.04
H_2 wt percent	0.04	0.017	0.004	0.007
N_2 wt percent	0.05	0.039	nil	0.012
Ce wt. percent	*N.T.	0.047	*N.T.	0.76
S wt. percent	0.036	0.013	*N.T.	0.05
HARDNESS				
Diamond Pyramid	637	174	*N.T.	205

*N.T.—Not Tested.
[1] Silvery.
[2] Silver-Yellow.
[3] Gold.

A careful consideration of the above table shows that by purification with cerium monosulfide, the hardness of the various samples tested was considerably reduced, in some cases to less than half of what it had been before purification. It is also to be noted that the impurity content was generally reduced. In similar tests run on vanadium using cerium monosulfide to purify the metal, a marked reduction in hardness was also observed, as shown below in Table B.

TABLE B

Metal	°C. Superheat	Pressure, mm. Hg	Hardness	
			Standard DPH [1]	Purified DPH [1]
Vanadium	50	1×10^{-5}	259	190

[1] Diamond Pyramid Hardness.

Metallographic examination of vanadium showed a very significant reduction in impurity occlusions.

This application is a division of application Serial No. 790,390, filed February 2, 1959 by Lawrence M. Litz now U.S. Patent No. 2,995,439 which issued on August 8, 1961.

What is claimed is:

1. A container for purifying at least one material selected from the group consisting of chromium, vanadium, chromium base alloys and vanadium base alloys which has as an integral part thereof cerium monosulfide in contact with said material.

2. A vessel for containing at least one pure material selected from the group consisting of chromium, vanadium, chromium base alloys and vanadium base alloys, which will maintain a low impurity level in said material, which has as an integral part thereof cerium monosulfide in contact with said material, said cerium monosulfide substantially surrounding said material thereby preventing contamination thereof.

References Cited in the file of this patent

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