

L066.843



PATENT SPECIFICATION

DRAWINGS ATTACHED

L066.848

Date of Application and filing Complete Specification: Oct. 2, 1963.

No. 30363/66.

Application made in United States of America (No. 229,833) on Oct. 26, 1962.

(Divided out of No. 1,066,847).

Complete Specification Published: April 26, 1967.

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Int. Cl.:—C 01 b 33/02 // B 02 f

COMPLETE SPECIFICATION

Method of preparing Silicon Particles

- We, TEXAS INSTRUMENTS INCORPORATED, a Corporation organised according to the laws of the State of Delaware, United States of America, of 13500 North Central Expressway, Dallas, Texas, United States of America, do hereby declare this invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—
- The present invention relates to the preparation of small particles of high purity silicon material suitable for use, for example, in the manufacture of electrolytic capacitors as described in Application No. 38859/63 (Serial No. 1066847).
- According to the present invention, a method of preparing particles of silicon material includes the steps of placing relatively large lumps of high purity silicon material into a hollow silicon container, and subjecting the container and the lumps of silicon material to severe shaking effective to cause cleavage of the lumps of silicon material into particles having extended and irregular surface areas.
- In a preferred embodiment the container is constructed from a pair of hollow domes using silicon having the same resistivity and dopant content (if any) as the starting lumps of silicon material.
- By way of example, the invention will be described in greater detail with reference to the accompanying drawing which illustrates part of an apparatus embodying the invention.
- The apparatus to be described is used to break up or cleave polycrystalline silicon, usually obtained in cast form as lumps of varying sizes, to provide small or particulate silicon pieces having extended and irregular surface areas.
- The apparatus, part only of which is shown, includes a pair of hemispherical silicon domes 1 and 2, used as a container to hold silicon starting material Si and which ensures that the purity of the starting material is maintained throughout the breaking process. Preferably, the domes 1 and 2 have the same resistivity and impurity (dopant) content (if any) as the starting material Si. The two domes are held between a pair of end plates 3 and 4 and clamped together by clamps 5 and 6 and form a hollow sphere to provide a container. The entire apparatus is then subjected to severe shaking and the relatively large silicon pieces Si inside the domes are broken into a myriad of relatively small particles. Use of the apparatus in this manner results in small silicon particles having irregular shapes, since the breaking process cleaves the cast silicon along grain boundaries. The irregularly shaped particles have a very high average surface-to-volume ratio as compared to spherical particles which have the minimum surface-to-area ratio.
- A method as described above may, for example, find application in preparation of silicon particles from high purity silicon material suitable for use in the manufacture of solid electrolytic capacitors, as disclosed in copending Application No. 38859/63 (Serial No. 1066847).
- WHAT WE CLAIM IS:—**
1. A method of preparing silicon particles, including the steps of placing relatively large lumps of high purity silicon material into a hollow silicon container, and subjecting the container and the lumps of silicon material to severe shaking effective to cause cleavage of the lumps of silicon material into silicon particles having extended and irregular surface areas.
 2. A method according to claim 1, in which the hollow container is formed by a pair of hollow domes.
 3. A method according to claim 2, in which the domes are hemispheres.
 4. A method according to any one of the preceding claims, in which the silicon container is made of silicon having the same resistivity as the starting lumps of silicon material.
 5. A method according to claim 4, for pre-

[Price 4s. 6d.]

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Method of preparing Silicon Particles

We, TEXAS INSTRUMENTS INCORPORATED, a Corporation organised according to the laws of the State of Delaware, United States of America, of 13500 North Central Expressway, Dallas, Texas, United States of America, do hereby declare this invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to the preparation of small particles of high purity silicon material suitable for use, for example, in the manufacture of electrolytic capacitors as described in Application No. 38859/63 (Serial No. 1066847).

According to the present invention, a method of preparing particles of silicon material includes the steps of placing relatively large lumps of high purity silicon material into a hollow silicon container, and subjecting the container and the lumps of silicon material to severe shaking effective to cause cleavage of the lumps of silicon material into particles having extended and irregular surface areas.

In a preferred embodiment the container is constructed from a pair of hollow domes using silicon having the same resistivity and dopant content (if any) as the starting lumps of silicon material.

By way of example, the invention will be described in greater detail with reference to the accompanying drawing which illustrates part of an apparatus embodying the invention.

The apparatus to be described is used to break up or cleave polycrystalline silicon, usually obtained in cast form as lumps of varying sizes, to provide small or particulate silicon pieces having extended and irregular surface areas.

The apparatus, part only of which is shown, includes a pair of hemispherical silicon domes 1 and 2, used as a container to hold silicon starting material Si and which ensures that the purity of the starting material is maintained [Price 4s. 6d.]

throughout the breaking process. Preferably, the domes 1 and 2 have the same resistivity and impurity (dopant) content (if any) as the starting material Si. The two domes are held between a pair of end plates 3 and 4 and clamped together by clamps 5 and 6 and form a hollow sphere to provide a container. The entire apparatus is then subjected to severe shaking and the relatively large silicon pieces Si inside the domes are broken into a myriad of relatively small particles. Use of the apparatus in this manner results in small silicon particles having irregular shapes, since the breaking process cleaves the cast silicon along grain boundaries. The irregularly shaped particles have a very high average surface-to-volume ratio as compared to spherical particles which have the minimum surface-to-area ratio.

A method as described above may, for example, find application in preparation of silicon particles from high purity silicon material suitable for use in the manufacture of solid electrolytic capacitors, as disclosed in copending Application No. 38859/63 (Serial No. 1066847).

WHAT WE CLAIM IS:—

1. A method of preparing silicon particles, including the steps of placing relatively large lumps of high purity silicon material into a hollow silicon container, and subjecting the container and the lumps of silicon material to severe shaking effective to cause cleavage of the lumps of silicon material into silicon particles having extended and irregular surface areas.

2. A method according to claim 1, in which the hollow container is formed by a pair of hollow domes.

3. A method according to claim 2, in which the domes are hemispheres.

4. A method according to any one of the preceding claims, in which the silicon container is made of silicon having the same resistivity as the starting lumps of silicon material.

5. A method according to claim 4, for pre-



paring silicon particles from doped silicon material, and in which the silicon container is constructed of silicon having the same dopant content as the starting lumps of silicon material.

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6. A method of preparing silicon particles substantially as described herein with reference

to and as illustrated by the accompanying drawing.

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Bk

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