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(54) **Production of silicon carbide bodies**

(57) A body consisting essentially of a coherent mixture of silicon carbide and carbon for subsequent *siliconising* is produced by casting a slip comprising silicon carbide and carbon powders in a porous mould. Part of the surface of the body, particularly internal features, is formed by providing within the mould a core of a material which retains its shape while casting is in progress but is compressed by shrinkage of the cast body as it dries and is thereafter removable from the cast body. Materials which are suitable for the core are expanded polystyrene and gelatinous products of selected low elastic modulus.

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SPECIFICATION

Production of silicon carbide bodies

5 This invention relates to the production of silicon carbide bodies.

It is known that dense silicon carbide bodies can be produced by forming a mixture of silicon carbide and carbon powders into the shape required and treating the formed mixture with molten silicon so that the carbon powder is converted to silicon carbide and a body obtained which is substantially silicon carbide with excess silicon present as a continuous phase. Such material is hereinafter referred to as self-bonded silicon carbide and the process of treating the mixture of silicon carbide and carbon powders with silicon to produce self-bonded silicon carbide is hereinafter referred to as siliconising.

It is also known that the mixture of silicon carbide and carbon can be formed into the shape required by slip-casting, that is, by mixing the silicon carbide and carbon powders with a suitable liquid medium to form a suspension or slip which is put in a mould porous to the liquid so that the liquid is absorbed by the mould and a solid cast obtained by deposit of the powder particles on the wall of the mould. The cast is then removed from the mould, dried and siliconised to produce a self-bonded silicon carbide body.

According to the present invention a body consisting essentially of a coherent mixture of silicon carbide and carbon for subsequent siliconising is produced by casting a slip comprising silicon carbide and carbon powders in a porous mould and part of the surface of the body is formed by providing within the mould a core of a material which retains its shape while casting is in progress but is compressed by shrinkage of the cast body as it dries and is thereafter removable from the cast body.

The part of the surface formed in accordance with the invention may in particular, be an internal feature or features such as a cavity.

The need for the material of the core to retain its shape during casting and to be eventually removable from the cast body is readily recognised.

Materials which are conventionally used in metal casting to produce similar cavities for example, waxes, are not suitable when slip-casting a green silicon carbide, however, because such a cast shrinks on drying and these conventional materials then exert a bursting pressure on a cast so that it cracks. One example of a material which has been found satisfactory as a core material in accordance with the invention is expanded polystyrene which is easily moulded into a required shape and is decomposed by the application of heat into products which are mainly volatilised, the residue being of small volume and readily removed. Gelatinous products have also been found satisfactory and by selecting one of sufficiently low elastic modulus cores may be produced which exert such a low stress on a cast as it shrinks that cracking of the shrinking case is avoided.

EXAMPLE

65 A plaster mould is made which is a negative copy

of the external shape of a component and a negative copy of the internal shape of the component is fashioned in expanded polystyrene or gelatine to form a core which is positioned within the mould.

70 Lugs may be provided on the core to facilitate its location in the mould. A slip containing carbon and silicon carbide in the ratio of 0.4:1 by weight is poured into the space between the mould and the core and the levels of the slip is topped up from time to time until casting has finished. The cast is allowed to stand in the mould to dry slowly. The mould is then disassembled and the core removed, conveniently by applying heat locally to melt it, for example with a hot wire. After further drying the case is siliconised as described, for example in UK Patent Specification No. 1,180,918.

The slip may be prepared as follows:-

Servacarb carbon black which is a carbon powder of particle size less than 1 micron produced and sold by Philblack Ltd., London, England, and commercially available green grit silicon carbide (97% of particle size less than 7 microns and a mean particle size of 3 microns) are dry blended in a ball mill for about two hours in the ratio 0.4:1 by weight. The dry mix is added to water containing 0.1% Dispex G40 defloculent (produced and sold by Allied Colloids Ltd., Bradford, England) to give a slurry which contains 70% by weight solids (45% by volume solids). Dispex is a Trade Mark and Dispex G40 is stated to be a salt of a polymeric carboxylic acid. The mixture is then ball milled for a further two hours to break up agglomerates and to form a uniform slip. The slip is passed through a coarse sieve to remove any lumps which remain and held under vacuum for a period of 5-10 min. to de-air it before pouring into the mould.

CLAIMS

1. The production of a body consisting essentially of a coherent mixture of silicon carbide and carbon for subsequent siliconising by casting a slip comprising silicon carbide and carbon powders in a porous mould and forming part of the surface of the body by providing within the mould a core of a material which retains its shape while casting is in progress but is compressed by shrinkage of the cast body as it dries and is thereafter removable from the cast body.

2. The production of a body as claimed in claim 1 wherein said part of the surface defines a cavity.

3. The production of a body as claimed in claim 1 or claim 2 wherein the core material is expanded polystyrene.

4. The production of a body as claimed in claim 1 or claim 2 wherein the core material is a gelatinous product.

5. The production of a body substantially as hereinbefore described with reference to the Examples.