

UNITED STATES PATENT OFFICE

2,510,219

GLOSSING CORUNDUM CRYSTALS

Gordon B. Graham, Kenmore, N. Y., assignor to
The Linde Air Products Company, a corporation
of Ohio

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5 Claims. (Cl. 41-42)

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This invention relates to a process for glossing the surfaces of corundum crystals, such as uniaxial crystalline articles of synthetic sapphire and ruby.

In U. S. Patents 1,806,588 and 1,806,589 there are disclosed procedures for treating the surfaces of articles of synthetic corundum with fused sodium tetraborate, and with a fused mixture of sodium tetraborate and sodium chloride. Upon testing the prior art procedures, it was found that they produced reasonably smooth surfaces on corundum crystals but the treated surfaces were characterized by the presence of small waves which gave them somewhat the same appearance as an orange rind's outer surface. Such a wavy surface is undesirable where almost perfect smoothness is required. An object of the present invention is to provide a novel process for uniformly and smoothly glossing articles of crystalline corundum without producing the wavy effect of the prior art.

In accordance with the present invention there is provided a novel process for glossing a uniaxial crystalline corundum article by treating its surface with a molten mixture consisting essentially of between 1 and 6 parts by weight of sodium carbonate to 1 part by weight of an alkali borate, such as sodium or potassium tetraborate. The most advantageous results are obtained with a fused mixture consisting essentially of 75% to 85% of anhydrous sodium carbonate and 15% to 25% of anhydrous sodium tetraborate (commonly known as anhydrous borax.)

Below 15% of sodium tetraborate glossing can be successfully carried out but is slower than is desirable. Above 25% of sodium tetraborate, the surface obtained is smooth enough for some articles, such as thread guides, but is not smooth enough for some other article such as gem stones.

It is believed that glossing takes place by preferential etching away of the high parts or projections on the surface of a corundum article thereby reducing the surface to a uniform level throughout.

It is advantageous to perform the novel glossing process of the present invention by immersing the corundum articles in a fused bath of the mixture contained in a suitable retort. A bath temperature of 800° to 950° C. is satisfactory, and a treatment time of between 5 and 8 minutes usually will develop the desired smooth and glossy surface when the bath is held in a platinum vessel. For similar results between 1 and 2½ hours are required when the bath is held in a nickel alloy vessel. Care should be taken to protect the

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corundum articles from thermal shock, as by preheating them before immersion in the fused bath, and by allowing them to cool slowly after removal from the fused bath.

After removal of the glossed crystalline corundum articles from the bath, the adhering solidified bath material can be removed in any suitable way, as by washing the articles in a dilute hydrochloric acid solution.

In a specific example of the novel glossing process, numerous short pieces of centerless-ground corundum rod were treated in a platinum vessel filled with a fused mixture consisting of about 80% of anhydrous sodium carbonate and about 20% of anhydrous borax at a temperature of about 900° C. for five minutes. Upon removing the pieces from the bath and washing them in a dilute hydrochloric acid solution, it was found that an acceptably smooth and glossy surface was obtained which was free from the waves produced by the baths of the prior art.

In another example sapphire thread guides were glossed successfully by immersion for about five minutes in a fused bath containing 50% of anhydrous sodium carbonate and 50% of anhydrous borax. The surface was sufficiently smooth and glossy for a thread guide, but was not as smooth as in the preceding example.

Numerous corundum articles have been successfully glossed by the process of the invention, for example, sapphire phonograph needles, thread guides, gem stones, and bearings. The treatment has proved more economical than polishing with diamond powder and more satisfactory than were the fused melts of the prior art. Furthermore, the process is more advantageous than polishing with abrasives on many odd shapes wherein the areas to be polished are inaccessible to mechanical polishing devices. Additionally, polishing with diamond powder leaves the article covered with minute scratches which act as stress raisers, whereas an article polished in the described manner is free from such scratches.

Specific examples of the process of the invention have been described only by way of illustration. It is to be understood that changes can be made in the details of the process within the scope of the appended claims.

I claim:

1. Glossing a crystalline corundum article by treating its surface with a fused mixture consisting essentially of between 1 and 6 parts of sodium carbonate to 1 part of an alkali borate.
2. Glossing a crystalline corundum article by

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treating its surface with a fused mixture consisting essentially of 75% to 85% of sodium carbonate and 15% to 25% of sodium tetraborate.

3. Glassing a crystalline corundum article by treating its surface with a fused mixture consisting of about 80% of sodium carbonate and about 20% of sodium tetraborate.

4. Glossing a crystalline corundum article by treating its surface with a fused mixture consisting of about 50% of sodium carbonate and about 50% of sodium tetraborate.

5. Glossing a crystalline corundum article by immersing it in a fused bath of a mixture consist-

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ing essentially of 75% to 85% of sodium carbonate and 15% to 25% of sodium tetraborate at a temperature between 800° and 950° C.

GORDON B. GRAHAM.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,806,589	Espig	May 26, 1931