

UNITED STATES PATENT OFFICE

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PROCESS OF IMPROVING CERTAIN PHYSICAL PROPERTIES OF SYNTHETIC PRECIOUS STONES

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Our invention relates to a method of improving certain physical properties or of refining precious stones which have been produced by way of synthesis as, for instance, by the well known Verneuil-process.

Synthetic precious stones are subject, owing to their origin to interior tensions which frequently cause the stones under treatment to burst in undesired directions, or produce fissures when plates are sawed or gems are cut, whereby the stones are rendered useless.

As to the choice of the embedding medium, it is, of course, to be considered whether or not the coloring matter of the stones is altered by a reducing or oxidizing atmosphere or surrounding substance; therefore stones which are susceptible to the influence of oxidizing media are preferably embedded in a reducing agent as, for instance, charcoal.

A further result of our tempering method especially when applied for a considerable length of time may be in some cases that oversaturation phenomena disappear, an excess of one of the constituents being separated in the basic constituent of the stone in the form of microscopically small crystals. For instance, spinels which are easily somewhat oversaturated with alumina, may by this treatment be given a moonstone-like appearance.

Thus the method of refining or improving the physical qualities of artificial precious stones according to our invention involves a considerable progress in the production and manufacture of synthetic precious stones.

We are aware that in former times it had been proposed to enlarge small artificial rubies by melting together ruby fragments to obtain what is called "rubis reconstitués". This well-known method has nothing in common with our invention which has only in view a refining process without influencing the outer form of the crystals.

Examples

(1) The brittleness of rubies or white sapphires whose base material is alumina, is substantially reduced by embedding the stones in an inert material such as fine sand or powder or alumina and heating the bedding to the temperature of red heat, i. e. about 800 to 1000° C. for about 8 to 12 hours. The embedding material simultaneously provokes a uniform heat-transmission and pro-

5 Synthetic precious stones are subject, owing to their origin to interior tensions which frequently cause the stones under treatment to burst in undesired directions, or produce fissures when plates are sawed or gems are cut, whereby the stones are rendered useless.

10 Our invention is based upon the discovery that by carefully tempering the raw stones, the tendency to crack is eliminated and, for instance, when sawing thin plates which are required for making axle-bearing jewels, fissures are no longer likely to occur. An extremely brittle stone liable to cracking is, for instance, the synthetic spinel, the hexahedral cleavability of which often suddenly makes itself known in an undesired manner, even after the cut is nearly finished. By the subsequent thermic treatment, the tendency towards cleavage is greatly diminished also in this case. For this treatment, the stones preferably divided into halves, or the intermediary or final products obtained therefrom, are heated in a suitable embedding medium such as powdered alumina, sand, charcoal or the like, or in a gaseous atmosphere. The tempering process may be performed, for instance in a crucible in such a manner that the stones, or products thereof, after careful preheating are exposed to red heat for several hours and then slowly cooled down.

15 Our invention, comprising a thermic method of refining or improving the physical qualities of artificial stones simultaneously affords further advantages in other respects. The color of certain kinds of stones, especially, for instance, the orange-colored padparajah, is intensified by the tempering process to a degree which cannot at all be attained by increasing the percentage of the dyeing agent in the base material, as almost all the stones would crack. Therefore if a subsequent thermic treatment is applied the addition of a far smaller percentage of the

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tests the stones against damage, resulting, for instance, from abrupt cooling.

When padparadjah is treated in the same manner its color is strongly intensified.

5 (2) Sapphire colored blue by a coloring matter susceptible to oxidation, is calcined in charcoal powder as reducing agent for about 8 to 12 hours at bright red heat, the access of
10 air being absolutely prevented. Hereupon the charge is allowed to cool down slowly.

(3) Sapphire colored blue by a coloring matter susceptible to oxidation is refined by heating it to a bright red heat in the reducing gaseous atmosphere of a current of hydrogen,
15 for some hours, and allowing the product to cool down slowly.

(4) Light red ruby is refined by heating it in the inert gaseous atmosphere of a current of nitrogen to a temperature of 700 to 900° C.
20 for 10 to 20 hours and then allowing the product to cool slowly.

We claim:

1. The process of improving certain physical properties of synthetic precious stones
25 which comprises subjecting synthetic precious stones containing oxidizable substances as a dyeing agent in a bedding of a reducing substance to a bright red heat for from 8 to 12 hours, and then slowly cooling the stones.

30 2. The method of improving the physical qualities of synthetic spinels which comprises embedding spinels somewhat oversaturated in alumina in an indifferent material, heating the bed to at least red heat, keeping said
35 temperature for some hours, slowly cooling down the product and thereby effecting a structural alteration consisting in a cloudy separation of microscopically small crystals of alumina.

40 3. The method of improving the physical qualities of raw synthetic precious stones which comprises changing the crystalline structure of the raw synthetic stones by a tempering process.

45 4. The method of improving the physical qualities of raw colored synthetic precious stones which comprises changing the crystalline structure of the raw synthetic stones and simultaneously homogenizing the disposition
50 of the particles acting as a dyeing agent in colored stones by a tempering process.

55 5. Synthetic precious stones of moonstone-like appearance consisting of synthetic spinels containing microscopically small crystals of alumina.

In testimony whereof, we affix our signatures.

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