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Title of the Invention: Method of Synthesis of Ornamental Stone

DETAILED DESCRIPTION OF THE INVENTION

The present invention relates to a method of synthesis of an ornamental stone.

Naturally produced cat's eye and the like stones exhibit extremely beautiful chatoyant glitter and are appreciated as ornaments, but are not easily available to general public due to their low yield and extremely high price.

It is an object of the present invention to artificially synthesize ornamental stones which exhibit such chatoyant glitter as cat's eye, easily at low cost. The method includes: placing, in a suitable fire- and corrosion-resistant crusible, a mixture of a basic component, such as quartz and feldspar; and a mineralizing component, such as boric acid and fluorite, added to which is a component that would crystallize into an aggregate structure of radial crystals, such as beryllium oxide and rare earth oxides; heating the mixture at a temperature which causes complete melting of the mixture and holding the mixture at such a temperature for a certain period of time; and gradually cooling the heated mixture at a cooling rate suitable for the kind and mixing ratio of the mixture, while which step the objective radially-aggregated structure of fibrous crystals is formed.

The chemical composition of a novel synthetic mineral thus produced generally corresponds to the chemical composition of a kind of alkali pyroxene, and the components required for the synthesis of this mineral consists of three parts, namely, (1) a basic component, (2) a mineralizing component[1], and (3) a component that induces crystallization into an aggregate structure of radial crystals[2]. These raw material components are, specifically, quarts, feldspar, alumina, limestone, zinc oxide, alkali carbonate, barium carbonate, and

[1] also referred to as "crystallizer" in a later article of Dr. Iimori
[2] also referred to as "crystal habit regulator" in a later article of Dr. Iimori

magnesium carbonate as the basic component. Among these, part or all of limestone may be substituted with one or more of calcium hydroxide and gypsum[3], and part or all of barium carbonate with one or more of barium hydroxide, baryte[4], or the like components. As the mineralizing component, i.e., the mineralizer, are used one or more of boric acid, borax[5], fluorite[6], magnesium fluoride, aluminum fluoride, alkali fluorides, cryolite[7], alkali fluorosilicates, alkali sulfides, alkaline earth sulfides, saltpeter[8], sodium chloride, and the like components. As the component that induces crystallization into an aggregate structure of radial crystals are used one or more of beryllium oxide, rare earth oxides, zirconium oxide, thorium oxide, lead oxide, magnesium phosphate, calcium phosphate, bone ash, alkali phosphates, and the like components.

According to the present invention, the above-mentioned three components are blended at a ratio suitable for producing the objective special pyroxene mineral, and thoroughly crushed and mixed. The obtained mixture is placed in a suitable fire- and corrosion-resistant crusible, and heated at 1150 °C to 1450 °C for about 30 minutes to 150 minutes, depending on the kind and mixing ratio of the blended raw materials. It is naturally necessary to maintain the mixture in a fully molten state during the heating.

Then, the temperature of the molten mass thus obtained, namely the artificial magna, is gradually reduced. In this step, by employing unique heat treatment period and temperature reduction rate, depending on the kind and mixing ratio of the mixture, for slowly cooling the mixture so as to reach room temperature at the expiry of about 30 hours to 60 hours, the objective novel synthetic mineral is obtained. This slow cooling operation is one of the essential conditions for mineralizing action of the synthetic magna and radial growth of fibrous crystals. Here, it is necessary to suitably control this temperature reduction rate depending on the kind and mixing ratio of the mixture as well as on the shape of the vessel used in the slow cooling, or the like factors. In some cases, the synthetic magma thus heated and melted may be transferred to another fire- and corrosion-resistant vessel separately held at about the same temperature, for the most appropriate temperature reduction.

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[3] calcium sulfate
[4] barium sulfate
[5] sodium borate
[6] calcium fluoride
[7] sodium hexafluoroaluminate
[8] potassium nitrate

An embodiment of the present invention will now be explained.

As the basic component:

quartz: 42.5

feldspar: 2.0

limestone: 12.0

alumina: 3.2

sodium carbonate (anhydrous): 14.3

zinc oxide: 1.5

75.5 in total;

as the mineralizing component:

boric acid: 7.5

sodium fluoride: 4.0

sodium sulfide: 0.05

11.55 in total; and

as the component that induces crystallization into an aggregate structure of radial crystals:

magnesium phosphate: 12.0

yttrium oxide: 0.95

12.95 in total (all by weight);

100 parts in grand total, are placed in a crusible, heated at 1360 °C for about 90 minutes, and then slowly cooled. Here, the temperature reducing rate is controlled so that the temperature is gradually reduced to 1100 °C by the expiry of 4 hours from the start of the slow cooling, and then reaches to 700 °C at 7 hours from the start of the slow cooling, 500 °C at 12 hours, 250 °C at 20 hours, 150 °C at 30 hours, and 100 °C at 40 hours. Further, by reducing the temperature to reach room temperature at the expiry of additional 5 to 10 hours, a novel synthetic mineral having a desired crystal structure, namely a crystal structure composed of a radial aggregate of fibrous crystals is obtained. The novel synthetic mineral thus obtained is the ornamental stone of the present invention.

By adding a suitable amount of various suitable inorganic pigments to the above-mentioned various components upon sintering of the ornamental stone, the synthetic mineral of the present invention may be pigmented in various colors. When a piece of the ornamental stone according to the present invention thus produced is seen while it is gradually rotated, the sheen of silk periodically comes and goes. That is, significant chatoyancy is exhibited.

Further, the ornamental stone of the present invention has a hardness somewhat lower in the plane perpendicular to, and some higher in the plane parallel to the radial axes of the aggregate of radial crystals and, as a whole, of 5.5 to 6.0 in Mohs' scales in average. The present ornamental stone has a specific gravity of 2.72, is optically isotropic, and has a refractive index of 1.526. Further, by cutting the ornamental stone of the present invention into arbitrary size and desired shape and suitably polished, moving glitter similar to that of polished, naturally-produced cat's eye is exhibited.

Claim

A method of synthesis of an ornamental stone exhibiting chatoyant glitter, characterized by: blending and mixing suitable amounts of one or more basic components suitably selected from quarts, feldspar, alumina, limestone, zinc oxide, alkali carbonates, barium carbonate, magnesium carbonate, and the like components, one or more mineralizing components suitably selected from boric acid, borax, fluorite, magnesium fluoride, aluminum fluoride, alkali fluorides, cryolite, alkali fluorosilicates, alkali sulfides, alkaline earth sulfides, saltpeter, sodium chloride, and the like components, and one or more components that induce an aggregate structure of radial crystals suitably selected from beryllium oxide, rare earth oxides, zirconium oxide, thorium oxide, lead oxide, magnesium phosphate, calcium phosphate, bone ash, alkali phosphates, and the like components; and subjecting the resulting mixture to heat treatment of heating the mixture to melt at 1150 °C to 1450 °C for a suitable period of time depending on the kind and mixing ratio of the mixture, and slowly cooling the heated mixture at a suitable temperature reducing rate depending on the mixed components to reach room temperature at the expiry of about 30 hours to 60 hours, for the object and as specifically described in the specification.

Appendix

A method of synthesis of an ornamental stone exhibiting chatoyant glitter, as recited in the claim comprising, as specifically described in the specification: blending and mixing one or more basic components, one or more mineralizing components, and one or more components that induce an aggregate structure of radial crystals, at a ratio suitable for producing a novel synthetic mineral that exhibits desired characteristics; heating the resulting mixture at 1150 °C to 1450 °C for a suitable period of time depending on the kind and mixing ratio of the mixture; and slowly cooling the heated mixture at a suitable temperature reducing rate, to thereby produce a novel synthetic mineral which has an aggregate structure of radial crystals and exhibits such special moving glitter as seen in cat's eye.