

crystals also form in boric-fluoride solutions; they show hexagonal and trigonal prisms. As a rule, analogous (-) ends of crystals are broken or monohedron. Crystals formed in boric acid solutions show higher number of faces. The trigonal pyramid {02-21}, the trigonal prism {10-10} and the trigonal pyramid {02-21} are formed in boric acid solutions. Habit of crystals is from short to long prismatic. Unlike natural tourmalines the crystals synthesized in boric-bearing hydrothermal solutions show fewer numbers of faces, which exclusively develop the following main habit forms: trigonal {10-10} and hexagonal {11-20} prism and trigonal pyramids {10-11}, {02-21} and {02-2-1}.

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### MS35.P29

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#### Synthesis of <sup>13</sup>C - diamonds in CaCO<sub>3</sub>-C system

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Isotope-pure <sup>13</sup>C-diamond was synthesized in melts of the Ca<sup>13</sup>CO<sub>3</sub> - <sup>13</sup>C system at 8.5 GPa, 2000 K (in anvil-with-hole apparatus) and 20 GPa, 2500 K (in multi-anvil press). Starting carbonate and graphite (metastable phase) materials were based on 100%-rich <sup>13</sup>C-carbon isotope. A "solution-melt" mechanism of <sup>13</sup>C-diamond crystallization was realized. The mechanism is characterized by formation of oversaturated in respect to diamond labile carbon solution in carbonate melt (under experimental PT conditions, melting of Ca-carbonate is congruent). Diamond synthesis with the use of mainly <sup>12</sup>C -based starting Ca-carbonate and graphite at 8 – 9 GPa, 2100 – 2300 K has been reported previously [1]. Colorless, transparent diamond single crystals of octahedral habit and 5-30 micron size have been grown and are shown in the fig. 1 together with the quenched Ca-carbonate melt. Raman spectra of the synthesized diamond (fig. 2) contain a narrow intensive peak 1280 cm<sup>-1</sup>, which is characteristic for <sup>13</sup>C-diamond based on 100%-rich <sup>13</sup>C-carbon isotope.

The experimental results are in agreement with phase diagram of CaCO<sub>3</sub>. A stable phase region of congruent Ca-carbonate melts within 2300 and 3500 K is determined at 20 GPa by the newest experimental studies [2]. This is of specific interest for the problem of "super-deep" diamond genesis in carbonate-rich growth media of the transition zone and lower mantle of the Earth.

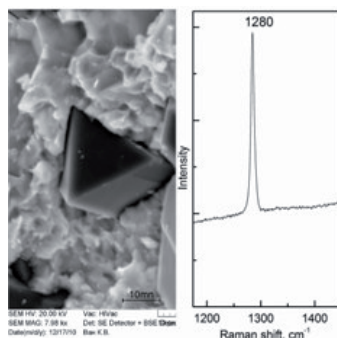


fig.1

fig.2

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[1] A.A. Shul'zhenko, *Get'man. German Patent* **1971**, *04*, 2032083 [2] A.V. Spivak, L.S. Dubrovinsky, Yu Litvin. A. Doklady, *Earth Sciences*, **2011** (in press).

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#### Growth and morphology of eulytite crystals synthesized in hydrothermal solutions

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Eulytite (Bi<sub>4</sub>(SiO<sub>4</sub>)<sub>3</sub>) is one of the rarest minerals in the nature. It forms as single crystals, aggregate of crystals and radial fiber spherulites. The crystals usually have tetrahedral habitus. Faces of crystal (2-11) and (211) are most developed. Less developed faces are (100), (110), and (111) and rarely developed faces are (511). [1]

Crystals of bismuth orthosilicate (eulytite) are using for scintillator in the high-energy physics, computer tomography, and dosimetry. Eulytite is one of the most promising materials for these purposes, but the problem of production still remains unsolved due to crystals growing from high viscosity melt.

Previously eulytite was synthesized in NaOH solution [2], but subsequent researches in this field did not carry out then.

We have performed hydrothermal synthesis of the fine crystalline bismuth orthosilicate (eulytite) at temperature 250 - 260°C and pressure 500 bars in solutions of sodium hydroxide (NaOH), ammonium fluoride (NH<sub>4</sub>F), and hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>). The stoichiometric mixture of standard Bi<sub>2</sub>O<sub>3</sub> and SiO<sub>2</sub> chemicals has been used as a starting material. Fine crystalline eulytite has been obtained in the experiments with duration from 7 to 12 days. In our experiments eulytite crystals were growing in ammonium fluoride and hydrogen peroxide solutions for the first time in the world.

Analysis of the run products has shown that hydrogen peroxide is the most perspective solvent for eulytite synthesis since in the system there are no elements strange in composition to eulytite.

SEM investigation of obtained crystals has shown that eulytite single crystals are growing in different solutions have tetrahedral habitus, and crystal aggregates generally grow with vague marked faces.

The crystals growing in oxygen peroxide were most analogous to natural eulytite.

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#### Conformational polymorphism in the crystal structure of HgBr<sub>2</sub> adducts of dppf

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