

Metasomatic transformation of calcium minerals associated with the activity of microscopic fungi

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The aim of this work was to research regularities of metasomatic transformation of calcium minerals (calcite, apatite) associated with the activity of microscopic fungi.

Experimental section

The biomimetic experiments on the effects of microfungi *Aspergillus niger* (active producer of organic acids) on calcite marble, fragment of mammoth tooth (hydroxyapatite-organic composite), a piece of single crystal abiogenic fluorapatite (Sludyanka deposit) and powder of synthetic precipitation hydroxyapatite have been carried out. The synthesis products were studied by X-Ray powder diffraction methods and scanning electron microscopy.

Discussion of Results

In all experiments crystals of calcium oxalates (monoclinic whewellite and / tetragonal weddellite) were obtained. On a marble surface crystallization of calcium oxalates starts from the formation of almost ideal dipyramidal and dipyramidal-prismatic (with dominant {101} pyramidal faces) crystals of metastable weddellite under pH<5. The stable calcium oxalate monohydrate whewellite forms as multiple spherulite looking intergrowths of lamellar crystals on hyphae in the fungal mycelium on the surface of culture broth. Tetrahonal biomimetic crystals are very close by their morphology and size to the crystals which we found in the oxalic patina on the surface of marble and limestone monuments in Tauric Chersonesos.

Metasomatic transformation of hydroxyapatite are more intense than fluorapatite, which is well explained by the respective solubility ratio. On the surface of mammoth tooth powder and powder of synthetic apatite the numerous lamellar whewellite crystals (from 1 to 70 microns) and spherulite looking intergrowths of its are seen. Besides there are large dipyramidal weddellite crystals up to 100 microns (often destroyed). On the surface of fluorapatite single crystal the continuous carpet of lamellar whewellite crystals (from 20 to 60 microns) with traces of their dissolution is seen. The traces of their dissolution are visible.. Weddellite crystals are absent.

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