

**THE REVELATION OF TYPOMORPHIC PROPERTIES OF METAMORPHIC CARBONATE ROCKS.**

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To determine the belonging of marble to a certain deposit, these laboratory methods of testing can be used: spectrophotometry, luminescence analyses and X-ray diffraction. Marble specimens from Karelia (Tivdia, Juven, Ruskeala), Middle Ural (Polevskoe, Ufaley), Greece and Italy (Carrara Mountains) were investigated using these methods. The age and formation condition of these rocks differ considerably and thus influenced the composition and structural features of the composing minerals. This is confirmed by the chemical analysis (Table 1).

*Table 1. Chemical composition of marbles in ppm*

Sample	Mg	Fe	Mn	Pb	Ce	Σ REE
Polevskoe	6488	111	44,1	0,8	0,5	5,9
Carrara Mount.	9958	287	102,8	1,1	1,5	6,4
Juven	1900	321	47,1	1,4	2,9	10,5

X-ray analysis revealed a significant difference in phase composition. Marbles from Juven (white-grey, coarse-grained) and Greece (white, fine-grained) proved to be the most similar to pure calcite. They contained only a little amount of quartz. Ural marbles (grey and white) contained a considerable dolomite and quartz mixture, and pink Tivdia marble consisted almost completely of dolomite with small amount of quartz. Lattice parameters of the investigated carbonates varied within the range  $a_0 = 4.804-4.981$ ,  $c_0 = 15.996-17.028$  Å;  $c/a = 3.33-3.44$ . Photoluminescence (PL) of marbles was investigated in visible and ultraviolet range. The intensive blue-violet luminescence is typical for white coarse-grained marbles. It is related to cerium impurities and is typical for Iceland spar. Other sorts of marble have different colors and variable luminescence in sample volumes. To obtain more extensive spectroscopic data, some samples were dissolved in hydrochloric acid. The optical absorption and the PL of their solution were investigated. We also investigated carbonates, used in the construction of Saint Isaac's Cathedral (architect Rinaldi, 18 c., Saint Petersburg) and Queen's pavilion in Peterhof (19 c.). The results are shown in Table 2.

*Table 2. Spectral characteristics of marbles*

Sample	Color	PL, $\lambda_{max}^{em}$ , nm	Solutions	
			absorp., $\lambda_{max}^{ab}$ , nm	PL, $\lambda_{max}^{em}$ , nm
Polevskoe	white	530	360	430
Carrara Mount.	white	340, 400 - 450	250, 330	340, 540
Juven	white - grey	430	250, 300, 360	420
Ruskeala	grey	520 - 550		
Tivdia	pink + white	520, 540	260, 335	540
Ufaley	grey	-		
ruins 18 c.	white	340, 400 - 450		

Thus, this investigation has shown that using these methods enables to determine characteristic features of marbles of a certain type and to determine its origin. The results can be used for the characterisation of the marble and during the construction and restoration works.