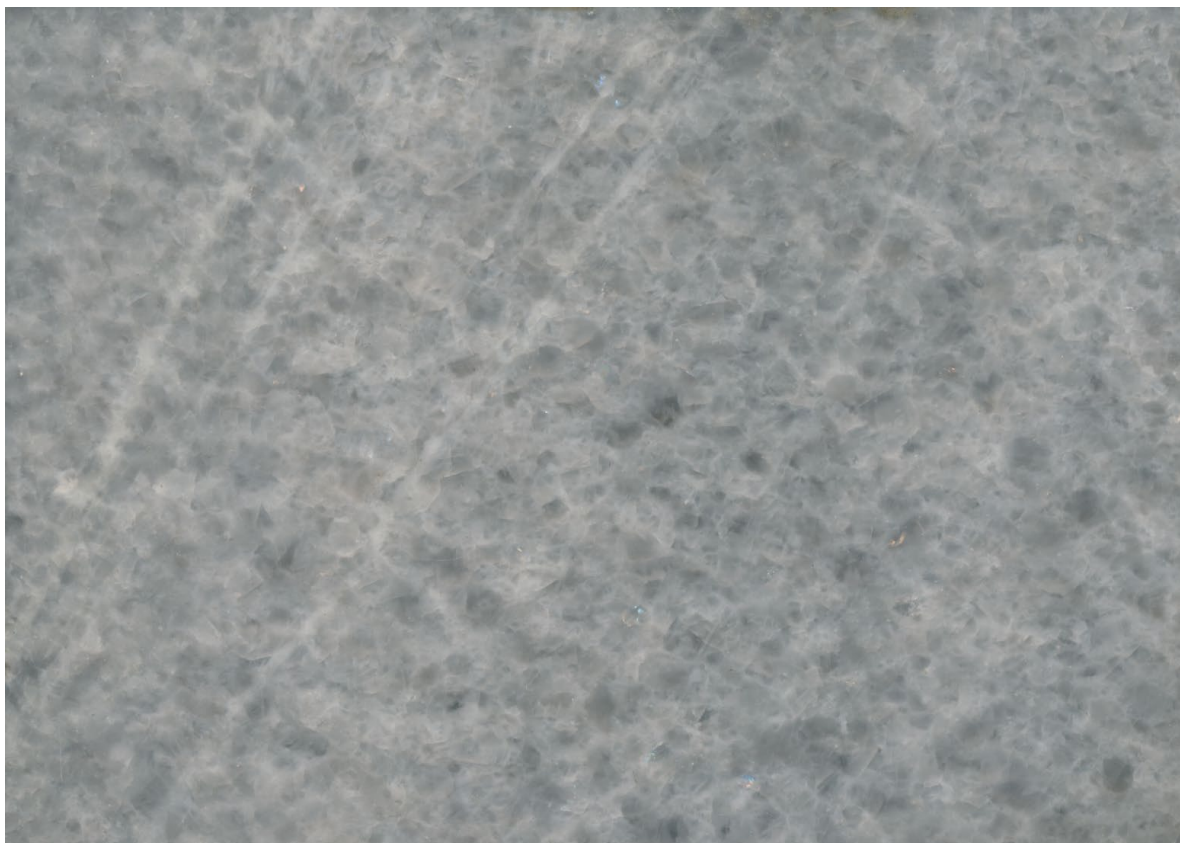


Krystal

Krastaler Marmor

Rauchkristall

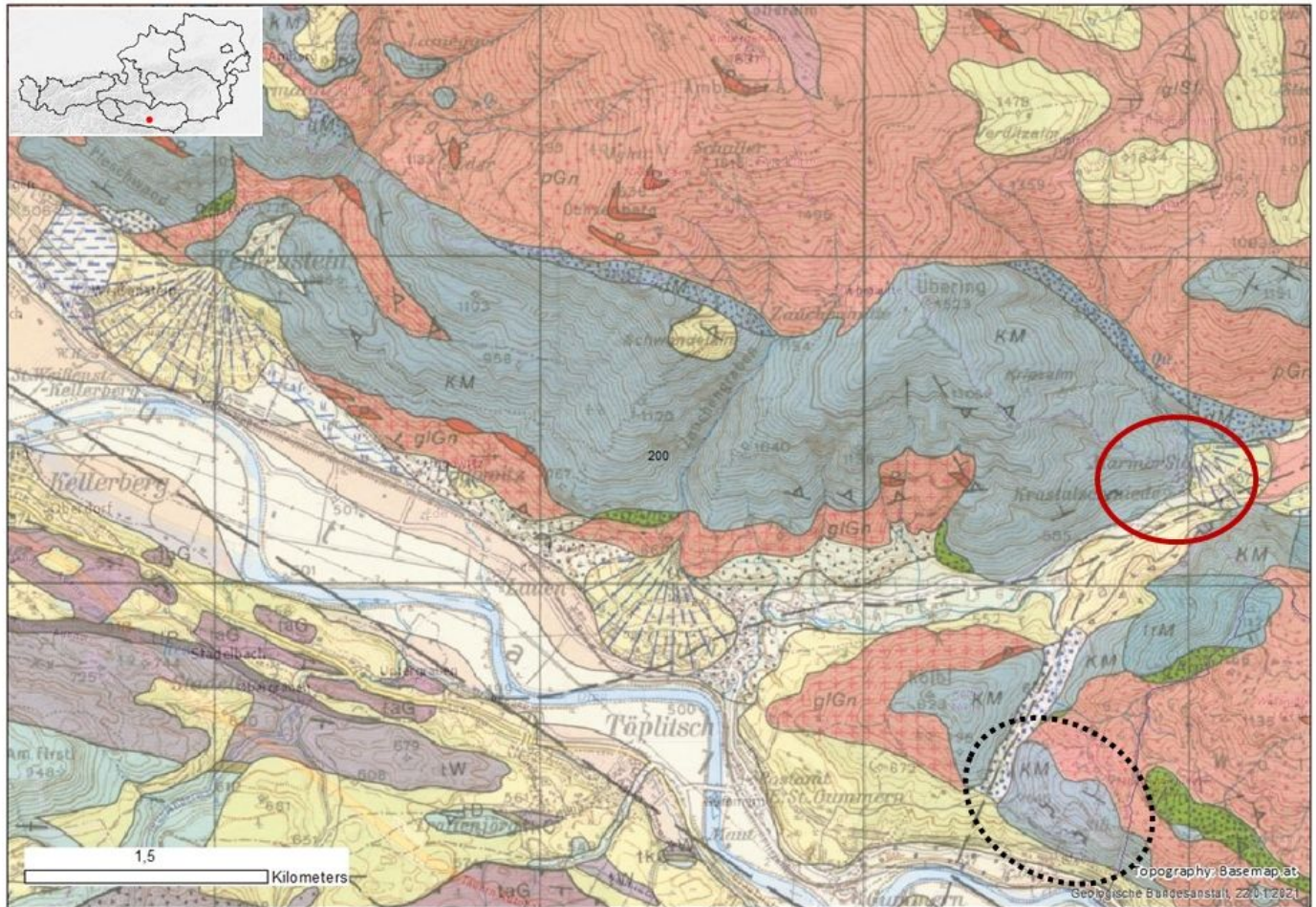


3 cm

Short description: light grey to white, coarse crystalline, massive calcareous marble

Commodity (vocabulary)	Lithology (vocabulary)	Typical colour (code list)	Place of origin			
			Country	County / District / Province	Municipality / Community	Place/town / Village
Commercial Marble	Marble	Light-grey	Austria	Villach Land / Kärnten (Carinthia)	Treffen am Ossiachersee Weissenstein	Krystal Gummern

Geological setting



Geology: The deposits are located in an approximately 8 km long calcareous marble belt (blue-grey signature on the map) situated north of the Drauf valley in Carinthia. Characteristic for that marble belt is the occurrence of occasional thin intercalations of mica marble, tremolite layers, mica schist, slate gneiss and amphibolite. Furthermore, aplite and pegmatite veins occur.

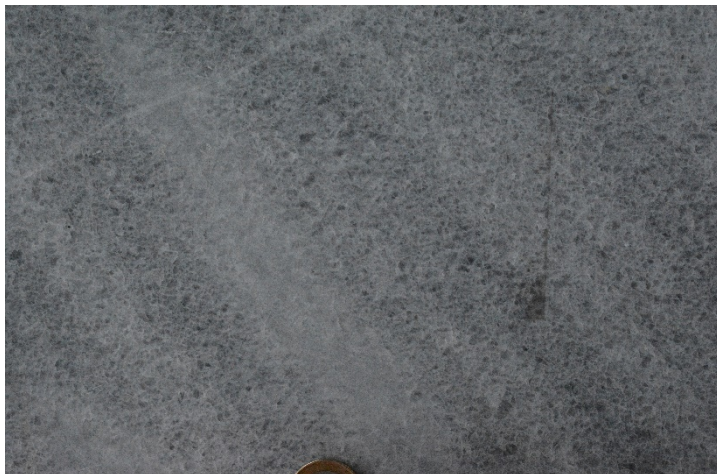
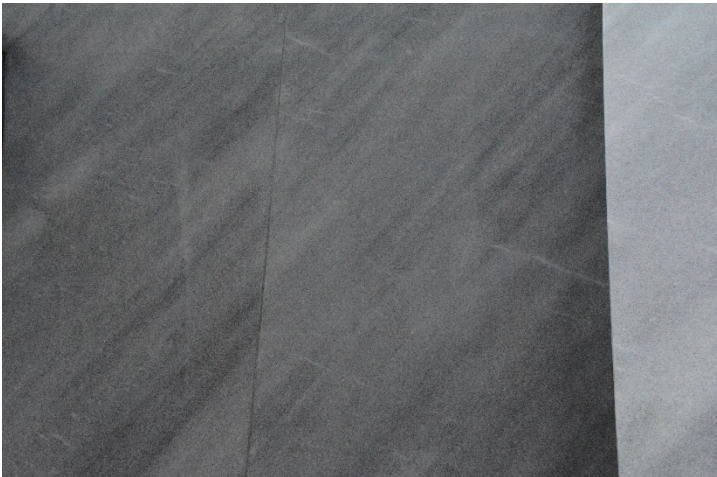
Production: Smaller quarries, most of which are no longer active today, can be found along the entire marble belt. The main quarrying area, however, is around Krastal (red marking) and Gummern (black marking), where the marble is still quarried today in large quarries. The mining area of Gummern in the south contains predominately white calcitic marble that is used as industrial mineral for the production of Ground and Precipitated Calcium Carbonate. In the quarry at Krastal in the north the predominately grey marble is sawn in benches and a subsurface chamber. The rock is only slightly fissured, so that large blocks (3-4 m³) and slabs (up to 8 m²) can be extracted. The scenery of this ornamental stone quarry has also been used for cultural events like sculptor's workshops and exhibitions.

Geological age: Paleozoic, Silurian - Devonian

Geological unit: Gummern Marble Lithodem; Millstatt Complex (URI: <http://resource.geolba.ac.at/GeologicUnit/101>); tectonic unit: Koralpe-Wölz Nappe Systeme (URI: <http://resource.geolba.ac.at/tectonicunit/156>)

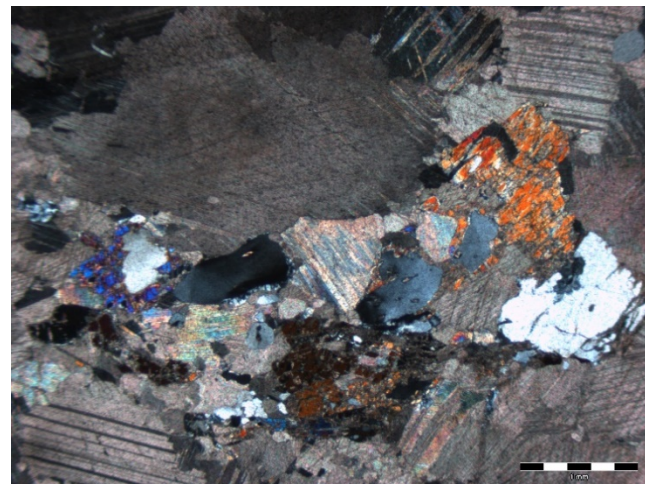
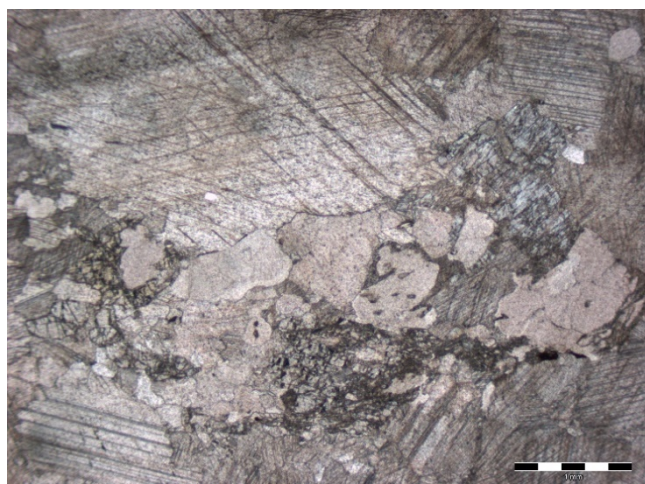
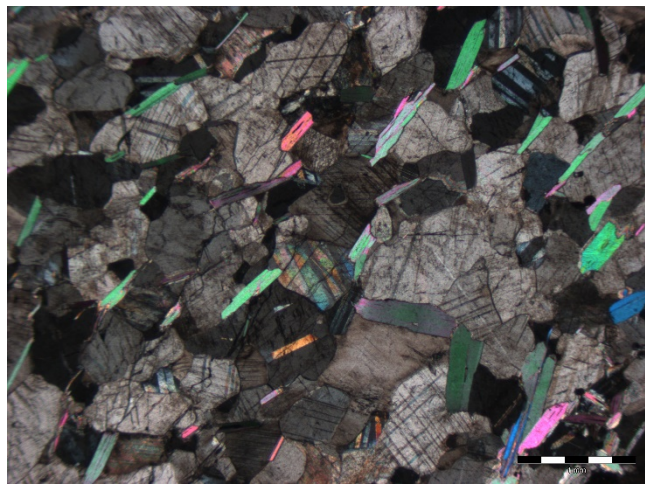
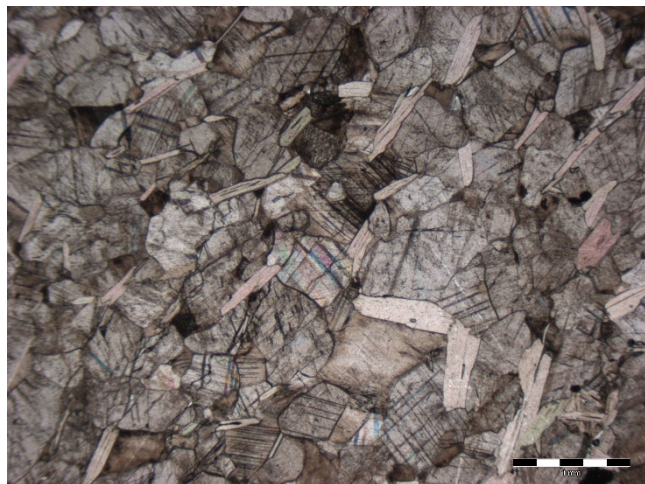
Application, use and heritage

Description: Krastal marble is considered to be an extremely weather-resistant ornamental stone. It is used as building stone, for monumental buildings, façade slabs, door and window jambs, plinth stones, balustrades, columns and pillars, stair treads and floor slabs, sculptural work and for grave monuments. The first quarrying activities already took place in Roman times, although the Romans preferred the white marble from Gummern nearby. Krastal marble is found, among other places, in the Museum of Art and the Museum of Natural History in Vienna (steps and plinths), on the façade of the University of Vienna, as wall cladding in Viennese underground stations, the entrance hall of the general hospital (AKH) in Vienna, at the Technical University in Graz and the Graz Opera House.



Description: left: façade claddings on a shop in Tuchlauben downtown Vienna (2 Euro coin on lower image); right: sculptures nearby the Bildhauerhaus Krastal (photograph courtesy of Emmy Woess) and a marble slab with a tremolite layer from the heaps on the quarry floor

Petrography



Description: homogeneously medium to coarse grained, partly layered calcitic and dolomitic marbles, partly containing mica, quartz, sometimes enriched in tremolite with diopside relics; Dol-exsolutions; length of scalebar is 1 mm

Source of information: Geological Survey of Austria (GBA)

Mineral composition

If no accurate number, use MM=main minerals, SM = Subordinate minerals, AM=accessory minerals

Calcite	Phlogopite	Biotite	Chlorite	Garnet	Graphite	Tremolite
MM	AM	AM	AM	AM	AM	AM
Fuchsite	Tourmaline					
AM	AM					

Source of information: Geological Survey of Austria (GBA)

Physical properties

Apparent density (EN 1936) kg/m ³	Open porosity (EN 1936) % vol	Water absorption at atmospheric pressure (EN 13755) % wt	Uniaxial Compressive strength (EN 1926) MPa	Flexural strength under concentrated load (EN 12372) MPa

Real density (EN 1936) kg/m ³	Total porosity (EN 1936) % vol	Water absorption coefficient by capillary (EN 1925) (g/m ² x s ^{0,5})	Flexural strength under constant moment (EN 13161) MPa

Frost resistance (EN 12371)				
Technological Test (Test A)				Identification Test (Test B): Number of cycles completed prior to stone failure
Flexural strength (EN 12372) after freeze-thaw cycling, MPa	Number of cycles	Uniaxial compressive strength (EN 1926) after freeze-thaw cycling, MPa	Number of cycles	

Resistance to ageing by thermal shock (EN 14066)			
Change in dynamic modulus of elasticity (increase: +; decrease: -) %	Change in open porosity (increase: +; decrease: -) %	Change in ultrasound pulse velocity (increase: +; decrease: -) %	Change in flexural strength under conc. load (increase: +; decrease: -) %

Abrasion resistance (EN 14157)			Resistance to salt crystallisation (EN 12370)	Breaking load at dowel hole (EN 13364)	
Method A - Wide Wheel Abrasion Test, mm	Method B - Böhme Abrasion Test, cm ³ / 50cm ²	Method C - Amsler Abrasion Test, mm	Change in mass (increase: +; decrease: -), %	Breaking load, N	Thickness of the test specimens, mm

Slip resistance by means of the pendulum tester (EN 14231 / CEN/TS 16165)			Rupture energy (EN 14158), Joule	Thermal Conductivity (EN 1745), W/m·K
Tested surface finish	Slip Resistance Value — SRV			
	Dry test condition	Wet test condition		

Source of information:

Chemical properties

Main elements

SiO ₂ (%)	Al ₂ O ₃ (%)	Fe ₂ O ₃ (%)	TiO ₂ (%)	MgO (%)	CaO (%)	Na ₂ O (%)	K ₂ O (%)	MnO (%)	P ₂ O ₅ (%)	SO ₃ (%)	LOI (%)
0,37	0,06	0,09	0,06	8,59	46,0	0,03	0,03	0,01	0,19	0,01	44,9

Trace elements

V (ppm)	Cr (ppm)	Mn (ppm)	Co (ppm)	Ni (ppm)	Cu (ppm)	Zn (ppm)	As (ppm)
< 15	19		< 5	< 5	6	13	0,11
Sr (ppm)	Cd (ppm)	Ba (ppm)	Pb (ppm)	Be (ppm)	Rb (ppm)	Bi (ppm)	U (ppm)
	< 0,8		13				
Sc (ppm)	Y (ppm)	Th (ppm)	Sb (ppm)	Ta (ppm)	Nb (ppm)	Zr (ppm)	Sn (ppm)
Ag (ppm)	B (ppm)	Mo (ppm)	W (ppm)	Ga (ppm)	Ge (ppm)	Se (ppm)	Cs (ppm)
< 0,8		< 5					
Tl (ppm)							

REE

La (ppm)	Ce (ppm)	Pr (ppm)	Nd (ppm)	Sm (ppm)	Eu (ppm)	Gd (ppm)	Tb (ppm)
Dy (ppm)	Ho (ppm)	Er (ppm)	Tm (ppm)	Yb (ppm)	Lu (ppm)		

Methods applied and source of information: average value from 3 samples; analysis of major, minor and selected trace elements: energy-dispersive X-ray fluorescence analysis; gravimetric determination of the loss on ignition; Geological Survey of Austria (GBA)

Sources of more information

Type of information	Name of provider	URL
This data sheet	Geological Survey of Austria (GBA)	https://www.geologie.ac.at
Non-commercial directory		
Commercial directory		
Scientific publication		
Other publication		

Hauser, Ch. mit Beiträgen von Anderle, N., Heinz, H., Plöchinger, B., Schmid, M.E. & Schönlaub, H.P. (1982): Erläuterungen zur geologischen Karte der Republik Österreich 1:50.000 Blatt 200 Arnoldstein.- 59 S., 13 Abb., Geologische Bundesanstalt, Wien.

Kieslinger, A. (1956): Die nutzbaren Gesteine Kärntens.- Carinthia II, Sonderheft, 17, 348 S., Verlag des Naturwissenschaftlichen Vereins für Kärnten, Klagenfurt.

Moshhammer, B. & Lobitzer, H. (Projektl.) (1998): Nutzungsoptionen ausgewählter österreichischer Vorkommen von hochreinen Karbonatgesteinen (Kalkstein, Marmor, Dolomit z.T.) - Lagerstättenkundliche Detailuntersuchungen.- Unveröffentlichter Bericht Projekt Ü-LG-038/96, 184 Bl., Geologische Bundesanstalt, Wien.

Müller, H. W. & Schwaighofer, B. (1990): Die römischen Marmorsteinbrüche in Kärnten.- Carinthia II, 189/109. Jg., S. 549-572, Klagenfurt.

Puhr, B. J. (2012): Metamorphic evolution and geochemistry of metacarbonate rocks of the Austroalpine Basement (Eastern Alps).- Dissertation Karl-Franzens-Universität Graz, 149 pp., Graz.

Picture of stone surfaces: Source: Kieslinger-Archive, Geological Survey of Austria, Wien

Geological map: Anderle, N. (1977): Geologische Karte der Republik Österreich 1:50.000 Blatt 200 Arnoldstein.- 1 Bl., Geologische Bundesanstalt, Wien.

Topographic map: Basemap.at (<https://basemap.at>)

Compiled by:	Geological Survey of Austria (GBA) https://www.geologie.ac.at	 Geologische Bundesanstalt
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