

Wachau

Wachauer Marmor

Waldviertler Marmor

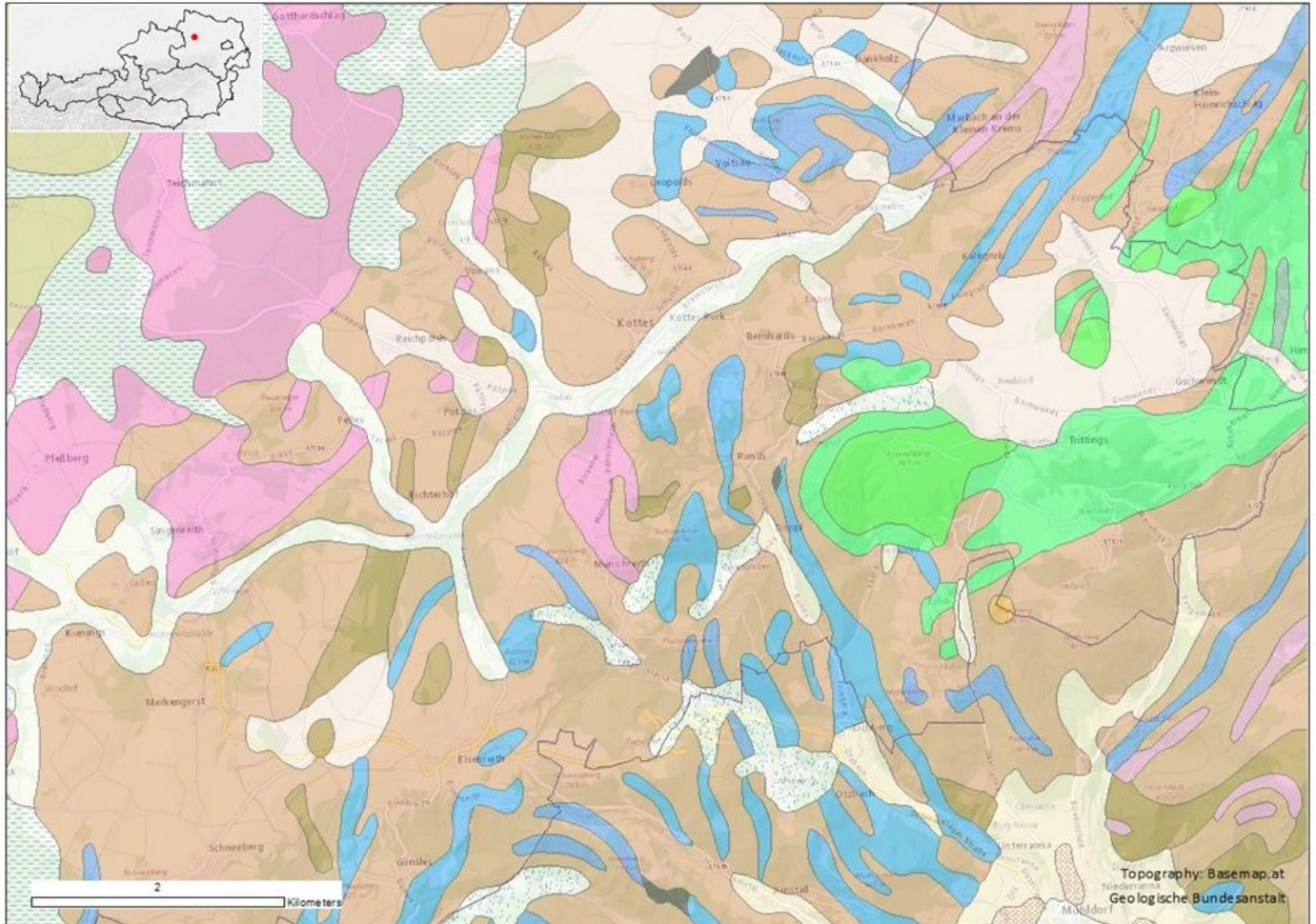


4 cm

Short description: fine- to coarse-grained, sometimes strongly folded marble with variable coloration from white to cream, grey, blue, greenish to dark grey; typical, however, is the alteration between dark grey (graphite rich) and light grey sections depending on the distribution of graphite as a coloring pigment in the rock; different cut layers result in banded, veined or cloudy distributed patterns

Commodity (vocabulary)	Lithology (vocabulary)	Typical colour (code list)	Place of origin			
			Country	County / District / Province	Municipality / Community	Place/town / Village
Commercial Marble	Marble	Grey	Austria	Zwettl / Niederösterreich (Lower Austria)	Kottes-Purk Albrechtsberg a.d. Gr. Krems Lichtenau im Waldviertel	Kottes Purk Elsenreith Marbach

Geological setting



Geology: The Wachau marble (blue signature in map) occurs in the Bohemian Massif mostly in the form of elongated bands and lenses traceable over long distances within paragneiss units. Typically, it emerges as Härtling ribs, which are easily recognized by their dry-loving vegetation.

The original carbonate successions were probably deposited in a shallow water evaporitic environment and later affected by amphibolite facies metamorphism and a final greenschist facies retrograde overprint.

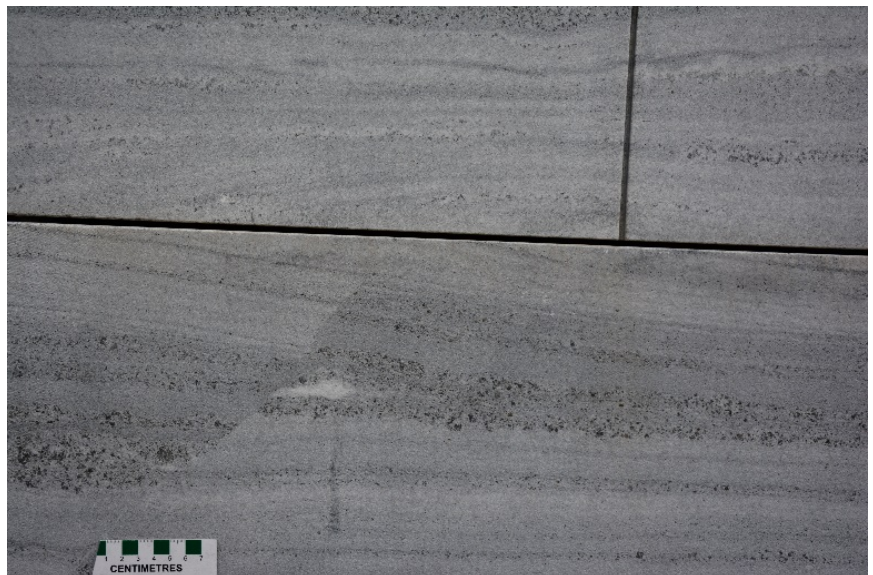
Production: The main quarrying area was and is the Kottes-Purk - Elsenreith - Marbach region. The first references to the use of the marble are already found in records from the year 1096 (Thinschmidt, 1995). The extraction of blocks up to 50 m³ is possible, usually blocks of about 3 m³ are mined.

Geological age: sedimentation during the Neoproterozoic/Precambrian (about 900 million years ago); metamorphism during the Carboniferous/Paleozoic (about 340 million years ago)

Geological unit: marble of the Drosendorf Nappe System (URI: <http://resource.geolba.ac.at/tectonicunit/102>)

Application, use and heritage

Description: Due to its lively folding, high strength and weathering resistance, Wachau marble was and is often used as an ornamental stone. Examples of its use in exterior applications are the facade of the Dianabad in Vienna or the facade of the Vinothek Domäne Wachau. It is also widely used as floor slabs, steps, columns, ballustrades, fountains, window and door jambs and, above all, for grave monuments.



Description: The front of the building that housed the former Dianabad, an indoor pool in the 2nd district of Vienna, gives an impression of some lighter grey variety of the Wachau marble.

Petrography

Description:

Source of information:

Mineral composition

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

Calcite	Dolomite	Clinopyroxene	Amphibole	Scapolite	Plagioclase	Potassium feldspar
MM	MM	SM	SM	SM	SM	SM
Quartz	Biotite	Graphite	Titanite	Pyrite	Zircon	
SM	SM	AM	AM	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

Values for calcite marble

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 (%)
0,62	0,01	<0,01	0,01	1,76	53,81	0,03	<0,01	0,032	0,012		

Trace elements

V (ppm)	Cr (ppm)	Mn (ppm)	Co (ppm)	Ni (ppm)	Cu (ppm)	Zn (ppm)	As (ppm)
<15	4		<5	<5	<2	3	<0,1
Sr (ppm)	Cd (ppm)	Ba (ppm)	Pb (ppm)	Be (ppm)	Rb (ppm)	Bi (ppm)	U (ppm)
	<0,8		22				
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: analysis of major, minor and selected trace elements: energy-dispersive X-ray fluorescence analysis; Geological Survey of Austria (GBA)

Chemical properties

Values for dolomite-rich marble

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 (%)
4,43	0,31	<0,01	0,05	20,96	30,24	0,02	0,17	0,117	0,031		

Trace elements

V (ppm)	Cr (ppm)	Mn (ppm)	Co (ppm)	Ni (ppm)	Cu (ppm)	Zn (ppm)	As (ppm)
<15	6		<5	<5	<2	11	0,10
Sr (ppm)	Cd (ppm)	Ba (ppm)	Pb (ppm)	Be (ppm)	Rb (ppm)	Bi (ppm)	U (ppm)
	<0,8		16				
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: analysis of major, minor and selected trace elements: energy-dispersive X-ray fluorescence analysis; 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		

Alber, J., Heinz, H., Klein, P., Schermann, O. & Seiberl, W. (1987): Rohstoffpotential südliches Waldviertel – Dunkelsteinerwald: Projektendbericht.- 186 S., 41 Abb., 2 Tab., 30 Blg., Geologische Bundesanstalt, Wien.

Fuchs, G. & Roetzel, R. mit einem Beitrag von Heinz, H. (1990): Erläuterungen zur Geologischen Karte der Republik Österreich 1:50.000 Blatt 36 Ottenschlag.- 64 S., 4 Abb., 2 Tab., 2 Taf., Geologische Bundesanstalt, Wien.

Högelsberger, H. (1989): Die Marmore und Kalksilikatgesteine der Bunten Serie – Petrologische Untersuchungen und geologische Konsequenzen.- S. 213-230, Jahrbuch der Geologischen Bundesanstalt, 132/1, Wien.

Matura, A. mit einem Beitrag von Heinz, H. (1989): Erläuterungen zur Geologischen Karte der Republik Österreich 1:50.000 Blatt 37 Mautern.- 65 S., 8 Abb., 1 Tab., 1 Taf., Geologische Bundesanstalt, Wien.

Moshammer, B. & Lobitzer, H. (1998): Nutzungsoptionen ausgewählter österreichischer Vorkommen von hochreinen Karbonatgesteinen (Kalkstein, Marmor, Dolomit z.T.) – Lagerstättenkundliche Detailuntersuchungen: Endbericht.- 184 S., 69 Abb., 9 Tab., 73 Taf., Geologische Bundesanstalt, Wien.

Thinschmidt, A. (1995): Die Nutzung des Marmors im Raum Kottes (Bezirk Zwettl, Niederösterreich).- S. 32-39, Res Montanarum, 11, Leoben.

Wiesinger, R. & Rohatsch, A. (2012): Verwitterungssimulation und gesteinsphysikalische Eigenschaften am Beispiel des "Waldviertler Marmors" aus Kalkgrub bei Kottes.- Das Waldviertel, 61. Jg., 1/2012, S. 1 - 13, Krems.

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

Geological maps: Fuchs, G. & Fuchs, W. (1986): Geologische Karte der Republik Österreich 1:50.000 Blatt 36 Ottenschlag.- 1 Bl., Geologische Bundesanstalt, Wien.

Matura, A. (1983): Geologische Karte der Republik Österreich 1:50.000 Blatt 37 Mautern.- 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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