

Blanco Macael Río Veteado



www.macaelmarmol.com

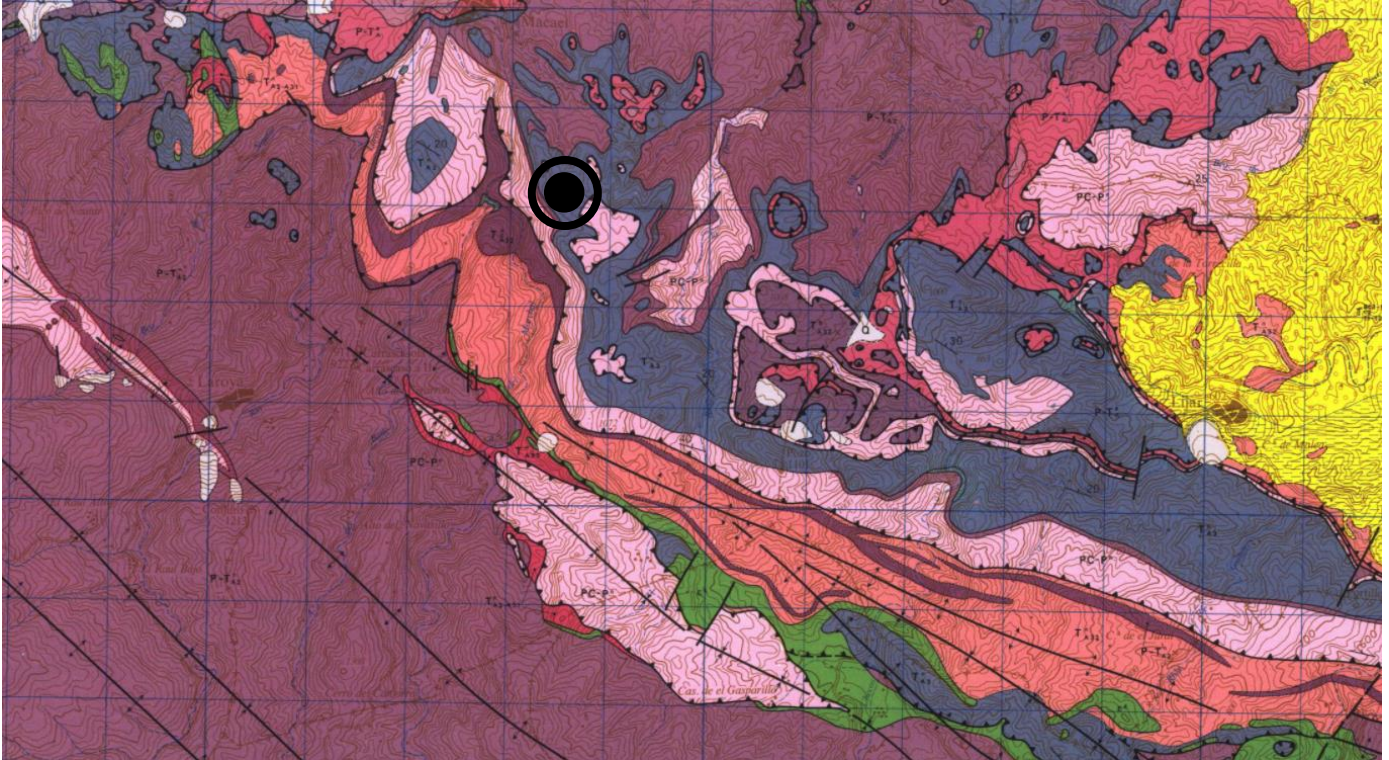
2 cm

Short description:

White homogeneous calcite marble with slight development of metamorphic foliation, forming thin grey bands.

Commodity (vocabulary)	Lithology (vocabulary)	Typical colour (code list)	Place of origin			
			Country	County / District / Province	Municipality / Community	Place/town / Village
marble	marble	White	Spain	Almería	Macael	Macael

Geological setting



Geology:

The Blanco Macael Río Veteado quarries are contextualized in the Betic mountain range, in the south-east of the Iberian Peninsula. The marbles exploited belong to the Las Casas Formation, included within the Nevado-Filábride Complex (internal zonas of the Betic mountain range). The lithological sequence of the Nevado-Filábride Complex can be divided into four formations. From bottom to top the first corresponds to dark schists and quartzites of about 3600 m thick. Above lie the quartzites of Benitagla and then the Tahal light schists, and at the top lies the schists and marbles (Las Casas Fm.). The thickness of the upper formations is on the order of 2000 m. The passage between the formations is stratigraphic and transitional. The metamorphism is inverted, being of higher grade to the top. This feature led to the proposal of superposition of tectonic units, with a higher grade of metamorphism in the upper ones, but the tectonic contacts between these units, according to our data, simply do not exist. The deposit of the lower formation had a syntectonic-compressional character while the other ones formed in extensional and post-tectonic environment in relation to the Variscan orogeny. New faults then formed permitted the extrusion of igneous rocks, including some ultrabasic ones.

Geological age: Triassic

Geological unit: Las Casas Formation

Application, use and heritage



www.marblestanitspain.com



www.rocanatural.es



www.morterosdemarmol.com



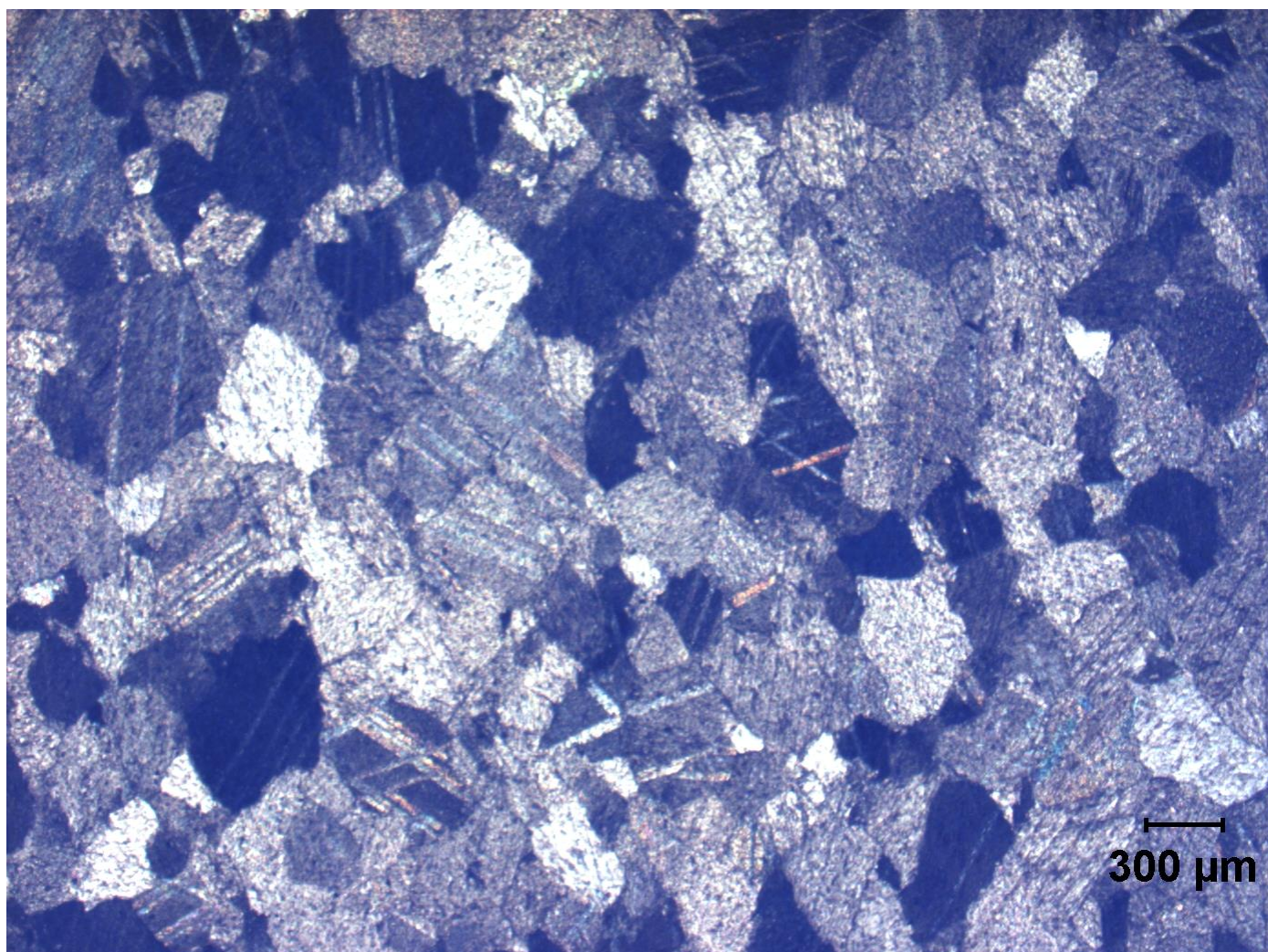
www.marmolesaira.com

Description:

Blanco Macael Río Veteado is one of the commercial varieties of the widely used Blanco Macael marble. With this generic name (Blanco Macael) there are other commercial varieties dependent on the company that markets it or the area of extraction (Navarro et al., 2019). Nowadays, the Blanco Macael Río Veteado is broadly commercialized around the world.

The use of marble from Macael region (Almería, Spain) began more than 5000 years ago (Navarro et al., 2019). The first small objects are from the Neolithic period and the first known sculptures are from the Phoenicians period. Since then, the marble's use has been continuous, especially since the eleventh century. Some of the best known examples of Macael marble in Spain can be observed in Roman cities (e.g. Itálica), in Muslim buildings (e.g., mosque of Córdoba or the Alhambra palace) or in Renaissance buildings such as the monastery of El Escorial, among many others. Some are declared World Heritage Sites by UNESCO. This makes the region one of the most important extraction centers in Spain, both at present time and historically.

Petrography

**Description:**

White homogeneous calcite marble with subtle development of metamorphic foliation forming thin grey bands. Calcite is the predominant mineral phase, with more than 99% of the modal composition. Other phases are also observed, such as micas, quartz, apatite, and opaque minerals, the latter responsible for the tenuous black and gray banding. The texture is granoblastic with subeuhedral crystals and straight intergranular contacts. The grain size of the crystals is between 1.20 and 2.20 mm.

Source of information:

- 1) Navarro, R., Pereira, D., Cruz, A.S., Carrillo, G. (2019): The significance of “white Macael” marble since ancient times: Characteristics of a candidate as Global Heritage Stone Resource. *Geoheritage*, 11: 113-123.
- 2) Spanish Geological Survey (IGME)

Mineral composition

MM=main minerals, SM = Subordinate minerals, AM=accessory minerals

Mineral 1 (%)	Mineral 2 (%)	Mineral 3 (%)	Mineral 4 (%)	Mineral 5 (%)	Mineral 6 (%)	
Calcite (99 %)	Dolomite (<1%)	Biotite – Muscovite (<1%)	Apatite (<1%)	Quartz (<1%)	Zircon (<1%)	

Source of information:

Spanish Geological Survey.

Mármoles españoles, 1990, ITGE.

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
2720	0.20	0.09	161.26	25.89

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
	2.20		

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	
17.34				

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
19.5			-0.19	2085	

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		
sawed	53	60		

Source of information:

- 1) Spanish Geological Survey;
- 2) RockMaquina – Piedras naturales, maquinaria y equipos.
- 3) Navarro, R., Pereira, D., Cruz, A.S., Carrillo, G. (2019): The significance of “white Macael” marble since ancient times: Characteristics of a candidate as Global Heritage Stone Resource. Geoheritage, 11: 113-123.

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 (%)
2.96	1.43	0.49	0.07	0.78	52.77	0.03	0.35		0.01	<0.01	40.11

Trace elements

V (ppm)	Cr (ppm)	Mn (ppm)	Co (ppm)	Ni (ppm)	Cu (ppm)	Zn (ppm)	As (ppm)
Sr (ppm)	Cd (ppm)	Ba (ppm)	Pb (ppm)	Be (ppm)	Rb (ppm)	Bi (ppm)	U (ppm)
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)
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:

Navarro, R., Pereira, D., Cruz, A.S., Carrillo, G. (2019): The significance of “white Macael” marble since ancient times: Characteristics of a candidate as Global Heritage Stone Resource. *Geoheritage*, 11: 113-123.

Sources of more information

Type of information	Name of provider	URL
This data sheet	Spanish Geological Survey RockMaquina – Piedras naturales, maquinaria y equipos. Navarro, R., Pereira, D., Cruz, A.S., Carrillo, G. (2019): The significance of “white Macael” marble since ancient times: Characteristics of a candidate as Global Heritage Stone Resource. Geoheritage, 11: 113-123.	
Non-commercial directory	Spanish Geological Survey	
Commercial directory	Fundación Mármol de Macael	https://macaelmarmol.com/
Scientific publication		
Other publication		

Compiled by:	Instituto Geológico y Minero de España (IGME) http://www.igme.es/	 Instituto Geológico y Minero de España
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