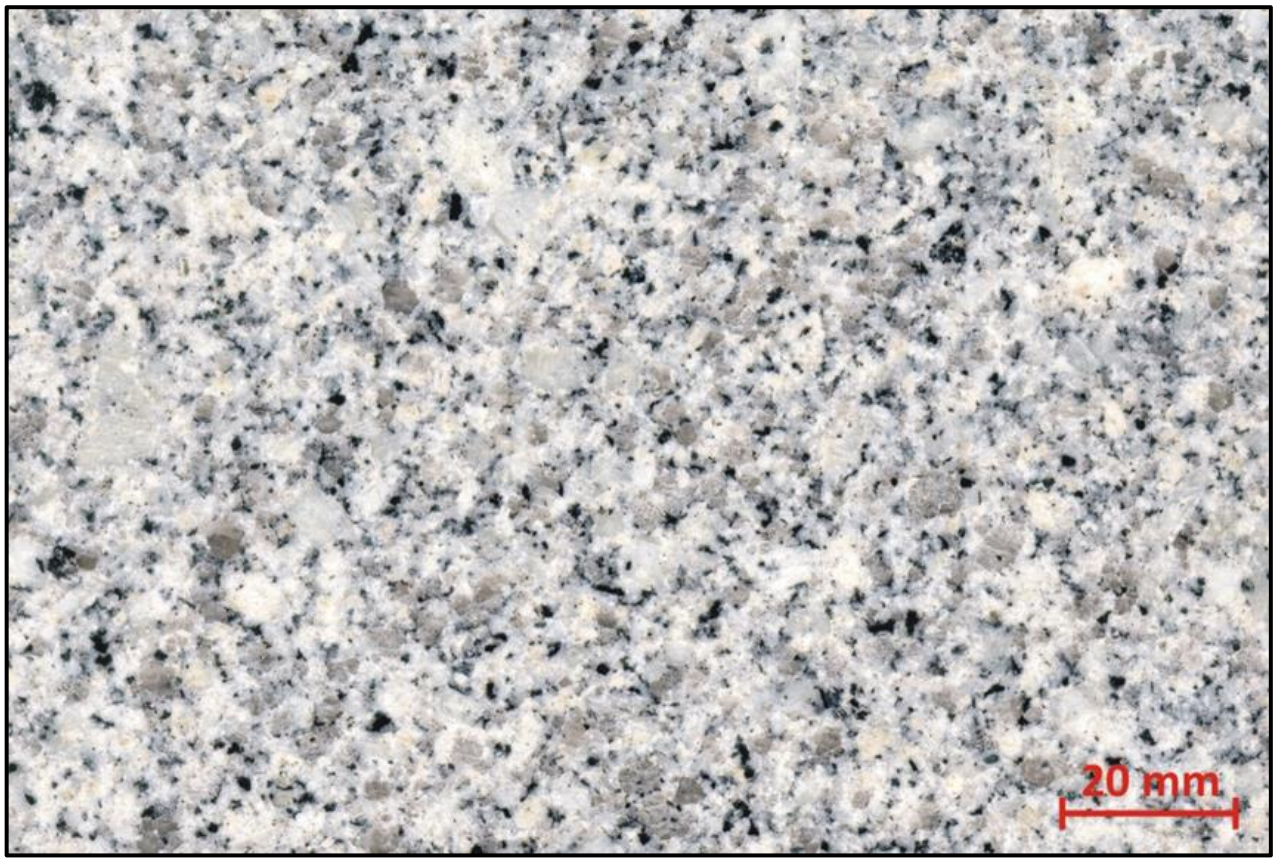
Pedras Salgadas

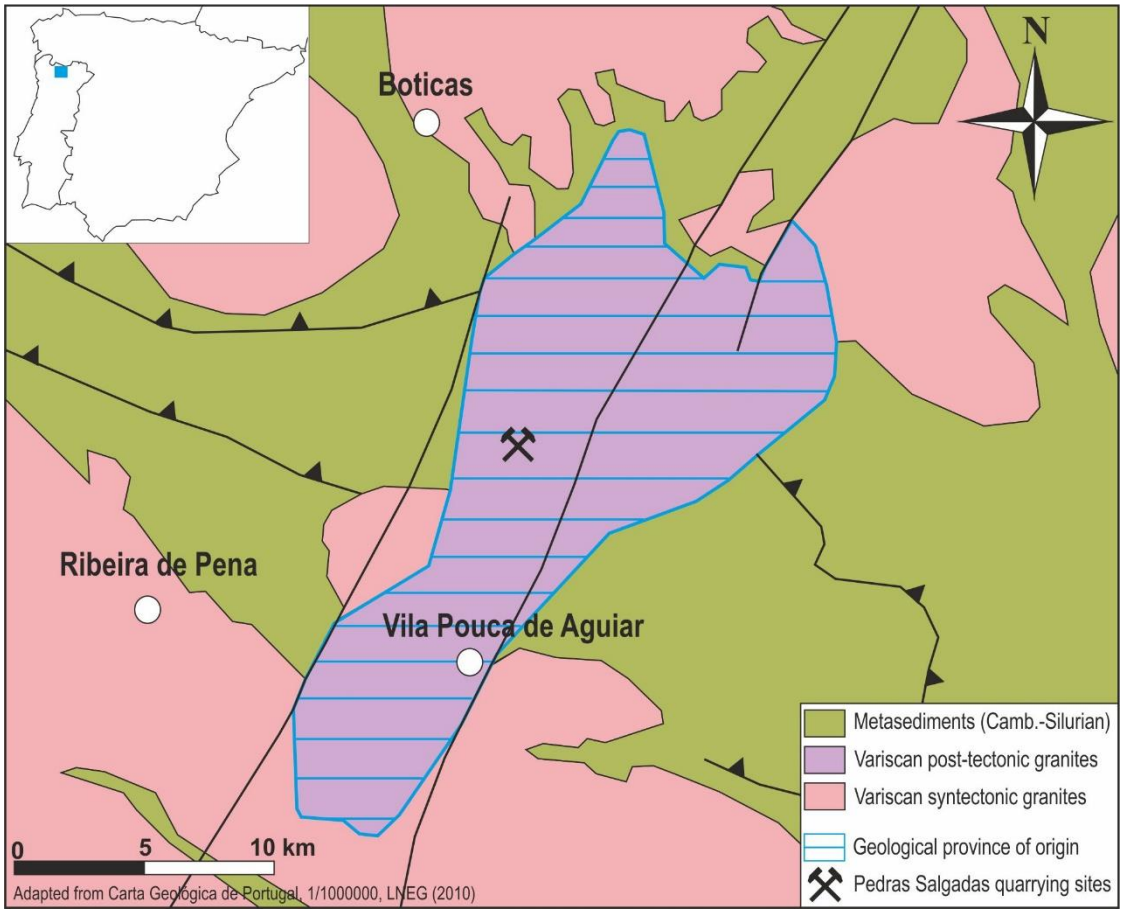
Cinzento claro de Pedras Salgadas



Short description:
Light-grey fine to medium grained biotitic granite, with disperse small K-feldspar megacrystals

Commodity	Lithology	Typical colour	Place of origin			
			Country	District	Municipality	Village
Commercial granite	Monzogranite	Light-grey	Portugal	Vila Real	Vila Pouca de Aguiar	Bragado

Geological setting



Geology:
The granite massif of Vila Pouca de Aguiar outcrops parallel to the NNE-SSW Régua-Verin Fault, which controlled its installation after the main events of the variscan orogeny during the Paleozoic. It is a post-tectonic massif of granites with biotite and calcium plagioclase. It integrates two granitic bodies with porphyritic texture: one is medium to coarse grained and the other is fine to medium grained, the latter being the source of the Pedras Salgadas ornamental stone.

Production:
The Pedras Salgadas granite, which presents quite homogeneous characteristics, is exploited in several neighboring quarries in the parish of Bragado, municipality of Vila Pouca de Aguiar. Three main fracturing systems affect the Pedras Salgadas granitic body, and consequently the production yield: N10-30E (parallel to the main faults, being the one that most conditions exploitation), N40-50W and N60-80E

Geological age: Permian
Geological unit: Granitic massif of Vila Pouca de Aguiar

Application, use and heritage

The extraction of Pedras Salgadas granite began in the early 1960s by hand-made means. The small produced pieces were mainly used for paving streets and building small houses. Extraction of large blocks only started after de 1980s with the introduction of modern machinery.
It is a stone used mainly for domestic consumption in cladding, building and street pavements, staircases and kitchen tops. More recently, it is being widely applied as large pieces for urban furniture

Description:
In addition to other stones, the Pedras Salgadas granite was used for the exterior cladding of the European Parliament.

Petrography

Description:
Photomicrograph of thin section (15x; transmitted natural light).
Medium grain monzogranite with microcline, oligoclase, quartz and biotite as essential minerals.
Light bluish-grey color, granular hypidiomorphic texture with porphyroid tendency.

Source of information:
Geological Survey of Portugal (LNEG - Laboratório Nacional de Energia e Geologia, IP).

Mineral composition

Oligoclase (%)	K-feldspar (%)	Quartz (%)	Biotite (%)	Muscovite (%)	Chlorite (%)
36.4	28.2	24.4	3.1	2.0	1.2
others[1)] (%)					
4.7					

[1)] Apatite, sphene, zircon, monazite, opaque minerals.

Source of information:
Geological survey of Portugal (Laboratório Nacional de Energia e Geologia, IP)

Physical properties

Apparent density (EN 1936) kg/m3	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
2610	0.8	0.3	214	12.7

Real density (EN 1936) kg/m3	Total porosity (EN 1936) % vol	Water absorption coefficient by capillary (EN 1925) (g/m2 x s0,5)	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	
13.2	48	206	56	

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, mm^3	Method C - Amsler Abrasion Test, mm	Change in mass (increase: +; decrease: -), %	Breaking load, N	Thickness of the test specimens, mm
20		0.2		2700	28.5

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		
matt polished	50	16	6	

Source of information:
Geological survey of Portugal (Laboratório Nacional de Energia e Geologia, IP)

Chemical properties

Main elements (%)

SiO_2	Al_2O_3	Fe_2O_3	TiO_2	MgO	CaO	Na_2O	K_2O	MnO	P_2O_5	SO_3	LOI
73.07	13.99	1.63	0.19	0.29	1.21	3.48	5.00	0.05	0.07		0.82

Trace elements (ppm)

V	Cr	Mn	Co	Ni	Cu	Zn	As
11	8		< 5	< 7	< 6	34	9
Sr	**Cd**	**Ba**	**Pb**	**Be**	**Rb**	**Bi**	**U**
77		342	30		241		11
Sc	**Y**	**Th**	**Sb**	**Ta**	**Nb**	**Zr**	**Sn**
8	31	19	< 8	< 6	15	109	15
Ag	**B**	**Mo**	**W**	**Ga**	**Ge**	**Se**	**Cs**
			<6	17			
Tl	**Hf**						
	<5						

REE (ppm)

La	Ce	Pr	Nd	Sm	Eu	Gd	Tb
Dy	**Ho**	**Er**	**Tm**	**Yb**	**Lu**		

Methods applied:
Determination of the main and trace elements: X-Ray Fluorescence.

Source of information:
Geological survey of Portugal (Laboratório Nacional de Energia e Geologia, IP)

Sources of more information

Type of information	Name of provider	URL
This data sheet:	Geological survey of Portugal (Laboratório Nacional de Energia e Geologia, IP	www.lneg.pt https://rop.lneg.pt/rop/index_en.php
Non-commercial directory:	Naturstein - Platform for Natural Stone Primeira Pedra	https://www.naturalstone-online.com/index.php?id=356&user_dnsaeng_pi1%5BsteinID%5D=5434 http://www.primeirapedra.com/stones/cinzento-pedras-salgadas/
Commercial directory:		
Scientific publication:	Engineering Geology	http://dx.doi.org/10.1016/j.enggeo.2017.01.030
Other publication:		

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