

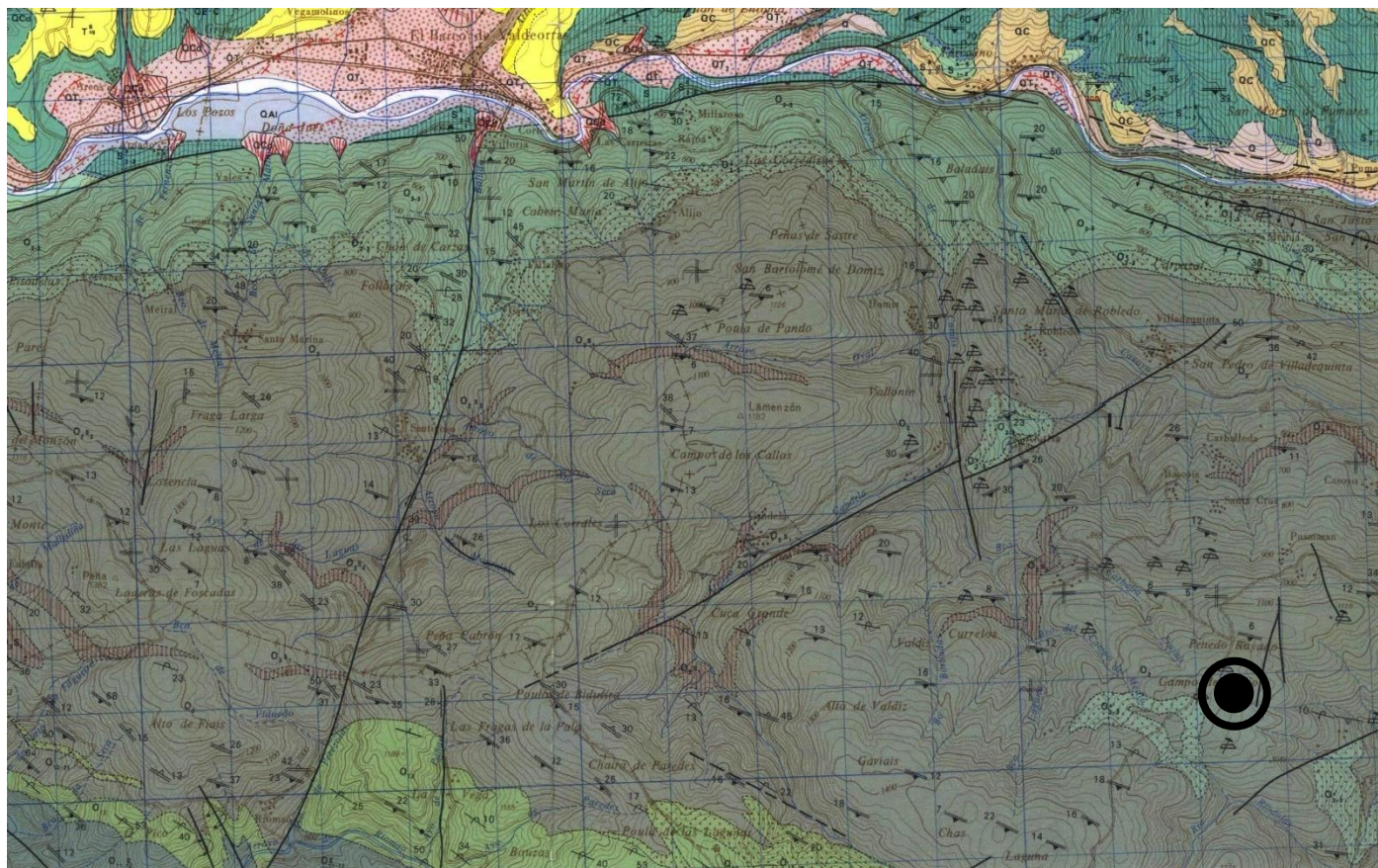
Valdeorras Casaio



Short description: Slates and siltstones with some intercalation of quartzites and sandstones, massive or in metric outcrops. It has sections of mining interest of fine or medium grain slate, blue-gray color, veined, with some dispersed pyrites, in differentiable sections of up to 40 m. Its fissility is usually high. The presence towards the upper part of the formation of diamectites is characteristic. The total thickness of this formation is estimated at about 200 m and at about 60-70 m from its base it has a quartzite package known as Os Foyos Quartzite, below it is where the productive section is located.

Commodity (vocabulary)	Lithology (vocabulary)	Typical colour (code list)	Place of origin			
			Country	County / District / Province	Municipality / Community	Place/town / Village
slate of tectonic compres	slate	black	Spain	Orense	Carballada de Valdeorras (OR- OU)	Carballada de Valdeorras

Geological setting



Geology: The Casaio Formation is a detrital formation formed by a sandy-quartzitic series with slate levels, with thicknesses of 15 to 30 m, and occasionally some calcareous spangles. These are gray, medium-grained slates, with some nodules and few metallic ones, and with more or less centimeter to decimeter sandy laminations. Their fissility is medium to high and they have less sulphides than the Luarca slates. They usually present abrupt lateral facial changes. The total thickness is of the order of 100 m and a section of slates of about 20 to 30 m of thickness located towards the base of the formation is exploited in the municipality of Carballada de Valdeorras.

Production: Various quarries in the área.

Geological age: Upper Ordovician.

Geological unit: Casaio Formation.

Geological age:

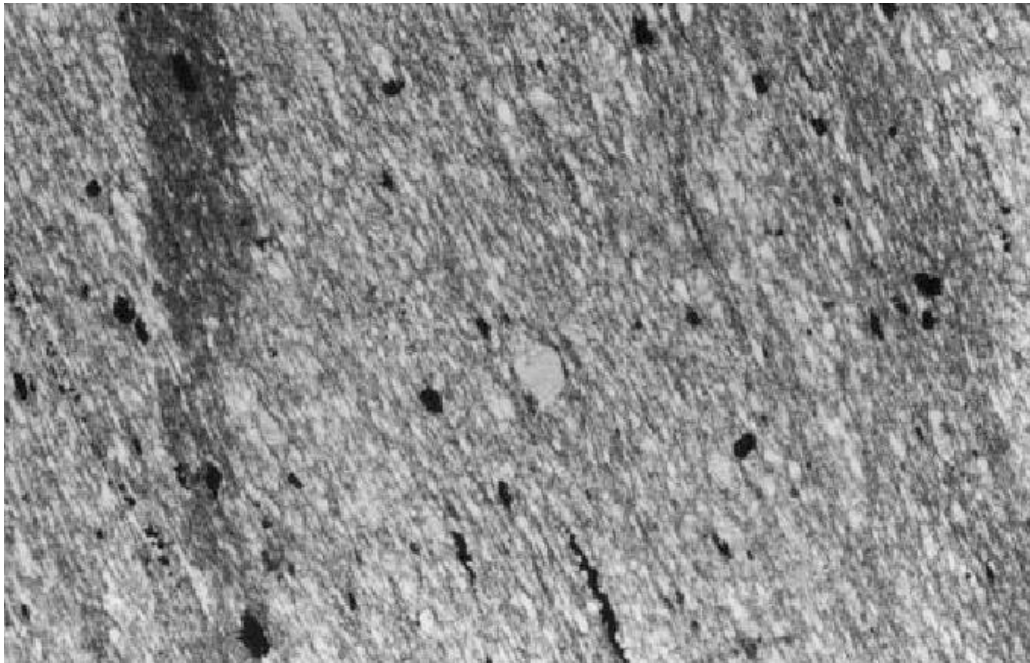
Geological unit:

Application, use and heritage



Description: Slate for roofing in a building.

Petrography



Description: Fine grained slate, with variable quartz content, presence of sulfides in some sections. The size of the sulfides is of the order of millimeter to centimeter and they are present mainly according to the planes of foliation.

Source of information: M. A. Rodríguez Sastre y L. Calleja. 2004. Caracterización del comportamiento elástico de materiales pizarrosos del Sinclinal de Truchas mediante ultrasonidos. Trabajos de Geología, Univ. de Oviedo, 24 : 153-164.

Mineral composition

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

Mineral 1 (%)	Mineral 2 (%)	Mineral 3 (%)	Mineral 4 (%)	Mineral 5 (%)	Mineral 6 (%)	Mineral 7 (%)
Chlorite (15-40%)	Feldspars (0-15%)	Mica (30-50%)	Quartz (20-35%)			
Mineral 8 (%)	Mineral n (%)					

Source of information: V. CÁRDENES, A. RUBIO ORDÓÑEZ, A. LÓPEZ MUNGUIRA Y C. MONTERROSO. 2010. Petrografía y mineralogía de las pizarras para cubiertas de la Península Ibérica en relación con su calidad. Trabajos de Geología, Universidad de Oviedo, 30: 412-420.

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
2860		0.5	81.06	58.82

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: Federación Española de la Piedra (1994): Granitos, Piedra Natural, Granitos de España. Catálogo de la Federación Española de la Piedra Natural. Madrid.

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 (%)

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:

Sources of more information

Type of information	Name of provider	URL
This data sheet	Instituto Geológico y Minero de España (IGME)	http://www.igme.es/
Non-commercial directory		
Commercial directory		
Scientific publication	V. CÁRDENES, A. RUBIO ORDÓÑEZ, A. LÓPEZ MUNGUIRA Y C. MONTERROSO. 2010. Petrografía y mineralogía de las pizarras para cubiertas de la Península Ibérica en relación con su calidad. Trabajos de Geología, Universidad de Oviedo, 30 : 412-420	
Other publication	Quiroga, J.R., Casares, A., Míguez, V., Vidal, J.R. (1997): La Piedra de Galicia. Xunta de Galicia, 319 págs. ISBN: 84- 453-2037-8.	

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