Pacios-Quiroga Alta

Short description: Slate of gray color, with a rough or grainy surface, with inclusions of metallic minerals, dispersed and of very small size.

Commodity (vocabulary)	Lithology (vocabulary)	Typical colour (code list)	Place of origin			
			Country	County / District / Province	Municipality / Community	Place/town / Village
slate	slate	grey	Spain	Lugo	Quiroga	Quiroga

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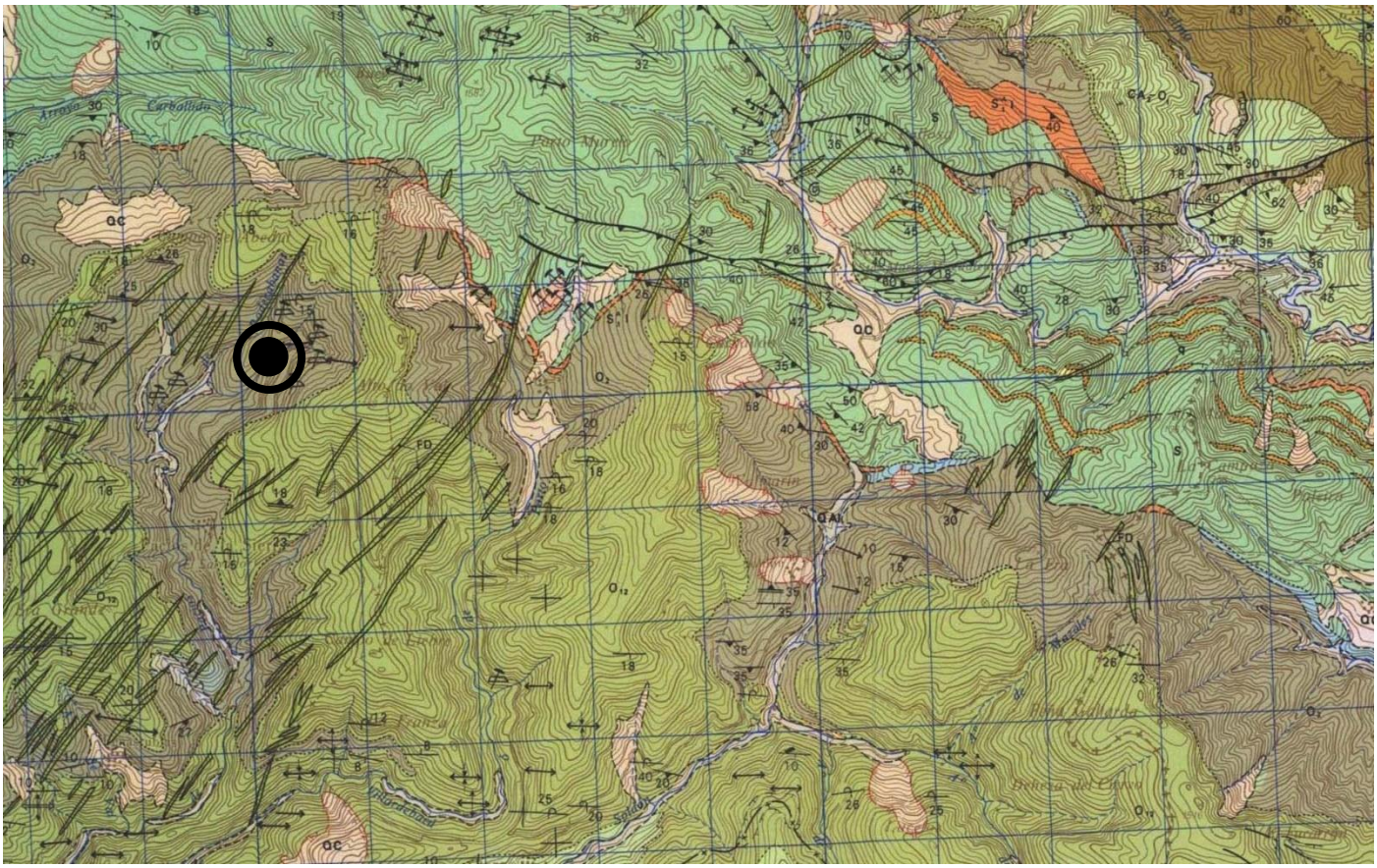
Geological setting



Geology: The Pizarras de Luarca formation is the geological unit in which the greatest activity for roof slates has traditionally been concentrated and the one that contributes the highest tonnage of this substance in Spain. The shales of the Pizarras de Luarca formation constitute a monotonous series of homogeneous black and gray shales, with fine or medium grain size, the presence of metallic sulphides (pyrite and pyrrhotin) is frequent. The metallic sulphides, appear frequently dispersed in the rock, and concentrated at specific levels, have varied shapes from cubic to nodular or as small scales of little thickness, with also variable sizes, the most frequent being between 2 and 3 mm. These shales present ocurrences of sandy laminations of centimeter or decimetric thickness, especially in their middle and lower part and in some sectors include intercalations of decimetric sandstones and ferruginous layers (30-40 cm thick) towards the roof, as well as volcanic and volcanoclastic layers of less than 5mof thickness. The thickness of this formation in this area can be around 200 m.

Production: Various quarries in the area.

Geological age: Mid Ordovician.

Geological unit: Pizarras de Luarca.

Application, use and heritage

Description: Roof of private building.

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 (30-40%)	**Feldspars (0-10%)**	**Mica (30-40%)**	**Quartz (15-25%)**			
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 cubiertasde la Península Ibérica en relación con su calidad. Trabajos de Geología, Universidad de Oviedo, 30 : 412-420.

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
2810		**0.9**	**11.36**	**46.5**

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	

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
4.06				**2693**	

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: 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.

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 cubiertasde la Península Ibérica en relación con su calidad. Trabajos de Geología, Universidad de Oviedo, 30 : 412-420	
Other publication		

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