Kaolin and Sericite Clays from SW Spain: Particle Size Distribution, Mineralogical and Ceramic Study

F. GONZALEZ-GARCIA, G. GARCIA-RAMOS, J.M. MESA, M.T. RUIZ-ABRIO, P.J. SANCHEZ-SOTO
Departamento de Química Inorgánica, Facultad de Química and Departamento de Investigaciones Físicas y Químicas, Centro Coordinado del C.S.I.C., Universidad de Sevilla, C/Tramontana, 41012 Sevilla, España

Nine samples of natural clays with high aluminium contents, from different southwestern Spanish deposits, mainly used in the ceramic industry were studied.

The deposits from Sta. Eufemia (Córdoba) and Garlitos (Badajoz) are formed by ampelitic Ordovician-Silurian materials, while the ones from Zalamea and Monterrubio de la Serena (Badajoz), which have similar characteristics, are Lower-Devonian in age. However, all the deposits show a very low-grade metamorphism, and there are some break networks formed by the Hercynian Orogeny which enabled the fluids to flow.

The Carboniferous deposits of the Province of Sevilla belong to coal exploitations. The Villanueva del Río y Minas deposit is of pre-Orogenic Westphalian origin; the one from Guadalcanal is also of post-Orogenic Westephanian origin.

The Conquista (Córdoba) bed belongs to an old alluvial deposit which developed over the granitic batholith of Los Pedroches. The Cazalla de la Sierra (Sevilla) bed is placed on the southern edge of a syenitic intrusion, weathered in a supergenic-like way. The Zalamea la Real (Huelva) deposit is formed by acid volcanic materials belonging to the SW Iberian pyritic belt.

With reference to the ceramic industry applications of high temperatures (stoneware, feldspathic tableware, porcelain and refractories), the particle size distribution, mineralogy and sintering temperatures are studied.

According to the particle size analysis, three groups of materials are differentiated: with 80%, 25% or 10% particle size smaller than 63 μm. The samples, according to the mineralogical data, excepting the feldspathic one of magmatic origin, are defined as kaolinitic and illitic-kaolinitic (sericites) types. There is also, among the latter ones, a sample with 25% pyrophyllite and 5% carbonates. The < 63 μm fraction is richer in kaolin minerals and generally has a greater content in Al_2O_3.

Sintering temperature diagrams to 1450°C show that a great part of these materials could be used as silica aluminous refractories, after the concentration process. The feldspathic sample is appropriate for feldspar earthenware, or as a raw material in vitrous ceramic ware.

Natural clays studied

Origin	Sample	<63μ (%)	Al_2O_3 (%)	Mineralogical composition (%)					Sintering temp. (°C)
				M	K	F	Q	Others	
Zalamea la Real	ZR		13.40	15	20	35	30		1.300
(Huelva)	ZR	<63μ~25	23.39	20	50	10	20		1.325
Cazalla de la	CZ		16.66	—	10	40	50	Na-	1.300
Sierra (Sevilla)	CZ	<63μ~30	24.97	—	20	55	25	Felds.	1.225
Conquista	CQ		30.18	15	60	15	15	Fe-	1.200
(Córdoba)	CQ	<63μ~95						gels	

Guadalcanal (Sevilla)	GC	Compact	19.33	40	35	10	15		1.200
Villanueva del Río y Minas (Sevilla)	VR		18.75	20	40	10	30	Coal	Crumbly
	VR	<63μ~10	18.19	20	45	10	25	Coal	>1.350
Zalamea de la Serena (Badajoz)	ZS		34.45	30	40	5	—	25 Py	1.325
	ZS	<63μ~80	33.26	35	35	5	—	25 Py	1.300
Monterrubio de la Serena (Badajoz)	MS		26.90	50	20	10	20		1.275
	MS	<63μ~80	31.52	55	30	5	10		1.250
Garlitos (Badajoz)	GA		30.26	35	45	10	10		1.250
	GA	<63μ~90	30.04						1.200
Santa Eufemia (Córdoba)	SE		27.20	55	20	10	15		1.250
	SE	<63μ~90							n.d.

M: mica; K: kaolinite; F: feldspars; Q: quartz; Py: pyrophyllite

Galán-Huertos E., 1972. Caolines españoles. Geología, mineralogía y génesis. Ph. D. Thesis, University of Madrid (Complutense), Spain.

González-García F., García-Ramos G. *et al.* Arcillas cerámicas de Andalucía. *Bol. Soc. esp. Cer. Vidr.* I: 3 1964 5, 481-502. II: 4 1965 1, 5-22. III: 5 1966 2, 229-245. IV: 5 1966 3, 337-359. V: 1966 6, 791-821. VI: 6 1967 2, 207-238. VII: 8 1969 1, 17-46. VIII: 9 1970 3, 265-296. IX: 10 1971 5, 545-572. XI: 16 1977 6, 353-360. XII: 17 1978 1, 17-22. XIII: 19 1980 3, 191-197.

Poyato-Ferrera J., Pérez-Rodríguez J.L., García-Ramos G., González-García F., 1977. Contribution to the knowledge of kaolin deposits of West Andalusia. *Proc. 8th Int. Kaolin Symp., Madrid-Rome*, 7-16.

Mesa-López Colmenar J., García-Ramos G., Pérez-Rodríguez J.L., González-García F., 1978. Occurrence of Pyrophyllite in La Serena area, Badajoz (Spain). *6th. Int. Clay Conf., Oxford*, Post. Sess.

García-Ramos G., Pérez-Rodríguez J.L., Poyato-Ferrera J., Mesa J.M., 1981. Kaolinization on acid volcanic rocks from SW Spain. *7th. Int. Clay Conf., Bologna-Pavia*, Post. Sess.

Manufacturing Techniques and Mineralogy of Antique Ceramics from Northern Italy

F. VENIALE, S. MASSA[1], F. CAUCIA, S. COCITO, M. SETTI

Dipartimento di Scienze della Terra, Sezione mineralogico-petrografica, Università di Pavia, Via A. Bassi 4, 27100 Pavia, Italia

[1] Soprintendenza Archeologica - Beni Culturali, Lombardia, Italia.

The results are part of a co-operative programme carried out by the mentioned scientific and cultural organizations. The material analyses have been helping to reconstruct the raw pug mixtures, manufacturing techniques and firing temperatures.

About 100 fired bodies from the St. Simpliciano church in Milan and the St. Maria chapel (Pieve Vecchia, Malerba, Garda lake), belonging to late Roman