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Case study

Manufacturing expedients in medieval ceramics in Apulia

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Abstract

A group of 51 shards of medieval polychrome glazed pottery, coming from Canosa castle archaeological site (Bari, Italy), has been investigated through surface analytical techniques, such as Scanning Electron Microscopy (SEM) with Energy Dispersive X-ray Spectroscopy (EDS) and elemental ones, such as Inductively Coupled Plasma–Optical Emission Spectroscopy (ICP–OES) and Absorption Atomic Spectroscopy (AAS) by flame and electro-thermal atomisation. The investigation was aimed at defining the elemental composition of pottery findings, identifying pigments and clarifying glaze types. The results of the analytical characterization allowed the identification of materials and technological expedients used for pottery manufacturing, highlighting original features in the production of the investigated pottery.

The quantitative analysis performed on ceramic paste, glaze and painted decorations provided a significant number of results, thus enabling their effective exploitation for multivariate statistical techniques, in order to find out possible groups of pottery items with defined similarity within the samples.

Keywords: Medieval pottery; Lead glaze; Proto-majolica; Apulia; Pigments; Chemical composition; Multivariate analysis; SEM–EDS

1. Research aims

This study was carried out within a wider research project, aimed at investigating technological aspects of medieval ceramic production in Southern Italy, with particular reference to two classes, lead glaze and lead–tin glaze ceramics (proto-majolica) which coexisted in the 13th and 14th century [1–9]. In particular, interest is focussed on ceramics with glazed covering painted red, colour used in polychrome with green and brown, bichrome with brown or in monochrome [6–9]. In addition, it should be noted that red is used also in association with over-painting in white or in combination with other decorative techniques: with incised motifs (graffiti) [7], or with grooved motifs, as in an as yet unpublished fragment, recovered in the excavation at the archaeological site of Siponto (Foggia).

The study of this ceramic class is among the most complex due to its wide territorial and chronological diffusion. Findings are frequent especially in Southern Italy, but have also been documented in some zones of the High and Mid Adriatic [10,11]. Various reasons have been proposed to justify the multiplication of findings. These include the apportionment of centres of fabrication, the lower cost of these products and the ease of their distribution through middle distance commerce, favoured by the economic system of the Swabian and Angevin periods, even if recently a wider framework of communications, commerce and exchange within the Mediterranean basin has begun to be outlined [12].

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As for the chronology, most of the findings are collocated in the second half of the 13th and in the 14th century, this latter period being that of greatest diffusion. There is a single finding in Calabria in a context of the first half of the 12th century [13], while their absence in the Frederick II age, believed until recently, has been challenged by recent findings at the Siponto site, datable to the first half of the 13th century. Delayed findings are registered in the successive period that signals the end.

The difficulty of the investigation is further increased by the state of the materials, very compromised, in nearly all contexts, because of burial conditions that have produced encrusted deposits, devitrification, iridescence and formation of scales. All this makes it essential the archaeometric contribution to define the nature of the intrinsic connotations and proceed to a correct archaeological classification. For this reason, it has been preferred to avoid definitions commonly used in archaeological literature such as *glazed ceramics*, *enamelled ceramics* or *proto-majolica ware* that, a priori, denote the type of covering, adopting instead a more generic terminology, merely aimed at describing exterior features (transparency or opaqueness). This is in agreement with current archaeological literature which has put up for discussion the same RMR denomination coined by David Whitehouse for this class of ceramics, substituting it with the more correct and generic term *glazed painted or polychrome ceramics* [14,15].

As for the intrinsic aspects of these ceramics, the prevalence of the lead nature of the glaze has been ascertained, while various factors have been raised to justify its frequent milky aspect [16]. Less attention has been paid to the definition of the composition of the pigments, particularly the red [1,6–10], of which different tones have been found, from rather bright to orange-ish hues [10].

This summarises the state of the studies from which the current investigation started, examining a conspicuous group of findings (51 samples), stored in the Canosa Civic Museum, originating from occasional finds on the western slopes of the castle, a fortress probably already existing in the High Middle Ages, which due to its strategic location dominated the entire low valley of the Ofanto river and was at the centre of an important road network towards Greece and the Middle East. Its periods of greatest vitality were the Norman and Swabian–Angevin, as attested by written sources [17].

Thus, this study seeks to address a number of objectives which are the correct classification of materials, the knowledge of technological features and the identification of production locations.

2. Experimental section

2.1. Materials

The examined finds, never previously studied, except for some fragments briefly mentioned in the literature [18,19], are morphologically homogeneous, almost exclusively open shapes, especially bowls and plates, together with less common sauce boats, the functional use of which, as containers for sauces or spices, clearly justified by the high socio-economic context of the origin, a court residence. Stylistically the collection is not homogeneous: along with routine products, there are instances of a higher quality level, appropriate to the original context: the castle.

The glaze, when visible, is present only on the internal surface of the open shapes, and on both surfaces of the closed ones. In some cases it appears to be translucent and colourless, applied on a ceramic body whose external surface is lighter in colour than the fracture, whereas in other fragments it seems opalescent.

Decoration motifs are taken from anthropomorphic, zoomorphic, vegetable, geometric and heraldic repertoires, a transversal repertoire, in the medieval lexicon, in various categories of objects: from sculpture, to metal, to textiles. Among the plant motifs there is that of the bush with chequered heart-shaped leaves, alternate with spindles, so widespread in this class, as documented in many contexts in Southern Italy, but also in the Middle East, from the fragment of Corinth, thought to have been imported from Apulia [20], to that of Atlit castle, along the coast of Israel, for which the chronology is certain, abandoned on the site in 1291 [21].

The investigated shards were coded as reported in Table 1, according to external features of the covering: translucent and colourless (T), opalescent (O) or opaque (W). Fig. 1 reports some examples representative of the finds examined.

2.2. Methods

The fragments were examined with different complementary techniques, namely: polarized-light Optical Microscopy (OM); Scanning Electron Microscopy (SEM) with Energy Dispersive Spectrometry (EDS); Atomic Absorption Spectroscopy (AAS), Inductively Coupled Plasma Emission Spectroscopy (ICP–OES). Multivariate statistical techniques were used for treating the compositional data.

Orthoscopic observations of the mineralogical textures were performed by means of an optical microscope (Carl Zeiss) on polished thin sections, whereas SEM investigations were carried out on the surface of untreated samples and on cross-sections and polished thin sections, after graphite sputter coating of the samples. Two SEM instruments, a S360 (Cambridge Instruments) and an EVO-50XVP (LEO) were used. Microanalyses were conducted using an Oxford-Link EDS instrument equipped with a Ge detector and with a 0.4-mm-thick Super Atmosphere Thin Window (SATW).

The surface of some samples was subjected to a procedure of "*hammering*" with a silicon carbide bit in order to produce

Table 1
Codification of finds.

Covering	Fragment
Translucent glaze	T13, T15, T18, T19, T20, T25, T26, T31, T32, T33, T42, T44, T45, T46, T50, T51
Opalescent glaze	O1, O2, O4, O5, O6, O8, O9, O10, O11, O12, O16, O17, O21, O22, O24, O29, O30, O34, O35, O39, O40, O41, O43, O47, O48, O49, O53
Opaque surface	W3, W7, W14, W23, W27, W36, W38, W52