



Contents lists available at ScienceDirect

# Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy

journal homepage: [www.elsevier.com/locate/saa](http://www.elsevier.com/locate/saa)

## Spectroscopic, microchemical and petrographic analyses of plasters from ancient buildings in Lamezia Terme (Calabria, Southern Italy)



Raffaella De Luca\*, Valentina Gigliotti, Mario Panarello, Andrea Bloise, Gino M. Crisci, Domenico Miriello

Department of Biology, Ecology and Earth Sciences, University of Calabria, Via P. Bucci, Cubo 12B, 87036 Arcavacata di Rende (CS), Italy

### ARTICLE INFO

#### Article history:

Received 7 May 2015

Received in revised form 26 June 2015

Accepted 11 August 2015

Available online 13 August 2015

#### Keywords:

Archaeometry

Pigments

Spathic calcite

Gold

Raman spectroscopy

SEM-EDS microanalysis

### ABSTRACT

This work shows the results of the spectroscopic, microchemical and petrographic study carried out on six plasters coming from three important residential buildings of the 18th century, located in Lamezia Terme (Catanzaro, Southern Italy). To study the provenance of the raw materials used to make the plasters, one sample of limestone and two samples of sand were also collected from the quarries near Lamezia Terme and compared with the historical plasters.

Samples were studied by polarized optical microscopy (OM), X-ray powder diffraction (XRPD), scanning electron microscopy (SEM) with energy dispersive X-ray spectroscopy (EDS) and Raman spectroscopy. The results of these analyses allowed to determine the mineralogical, petrographical and chemical characteristics of the plasters, identify the pigments used for their coloration and provide useful information about the building techniques, the raw materials employed and the production technology of plasters during the 18th century in Lamezia Terme. SEM-EDS microanalysis also revealed the presence of gold and silver on the surface of two samples.

© 2015 Elsevier B.V. All rights reserved.

### 1. Introduction

The city of Lamezia Terme is located on a floodplain in the south of Italy, in the middle of the Calabria region (Fig. 1a), it comes from the union of the three municipalities: Nicastro, Sambiasi and Sant' Eufemia.

In this city, the residential buildings of the 18th century have a huge artistic-architectural importance because they represent a particular expression of the baroque and rococo styles. At that period, important plasterers, often specialized out of the territory, were engaged in the realization of decorations for the facades of some churches. At the same time, the upper classes of the city commissioned, at these plasterers, elaborated decorations for their buildings to declare their social prestige.

The buildings of this period are characterized by decorations with sophisticated symbolic meanings and allegories designed to celebrate the importance and the strength of families, often directly involved in the projects [1]. Facades are marked by a succession of balconies with iron "goose breast" railings. The portal is decorated with the family crest and phytomorphic and zoomorphic elements. It is often flanked by pilasters and overtopped by balconies which are framed by decorative plasters that make them look like sumptuous mirrors.

In this work three residential buildings of the 18th century were studied. Palazzo Statti (Fig. 1c), in Nicastro, is characterized by a dense decoration on the upper band and on the corner, it presents also concave and convex surfaces that, alternate each other, giving to the facade the appearance of a parchment [2].

Palazzo Nicotera, in Sambiasi, shows a particular decoration of the balconies (Fig. 1d). The birds in the middle are probably phoenixes, birds that can rise from their ash [3] and the decorations on the sides seem to be flames.

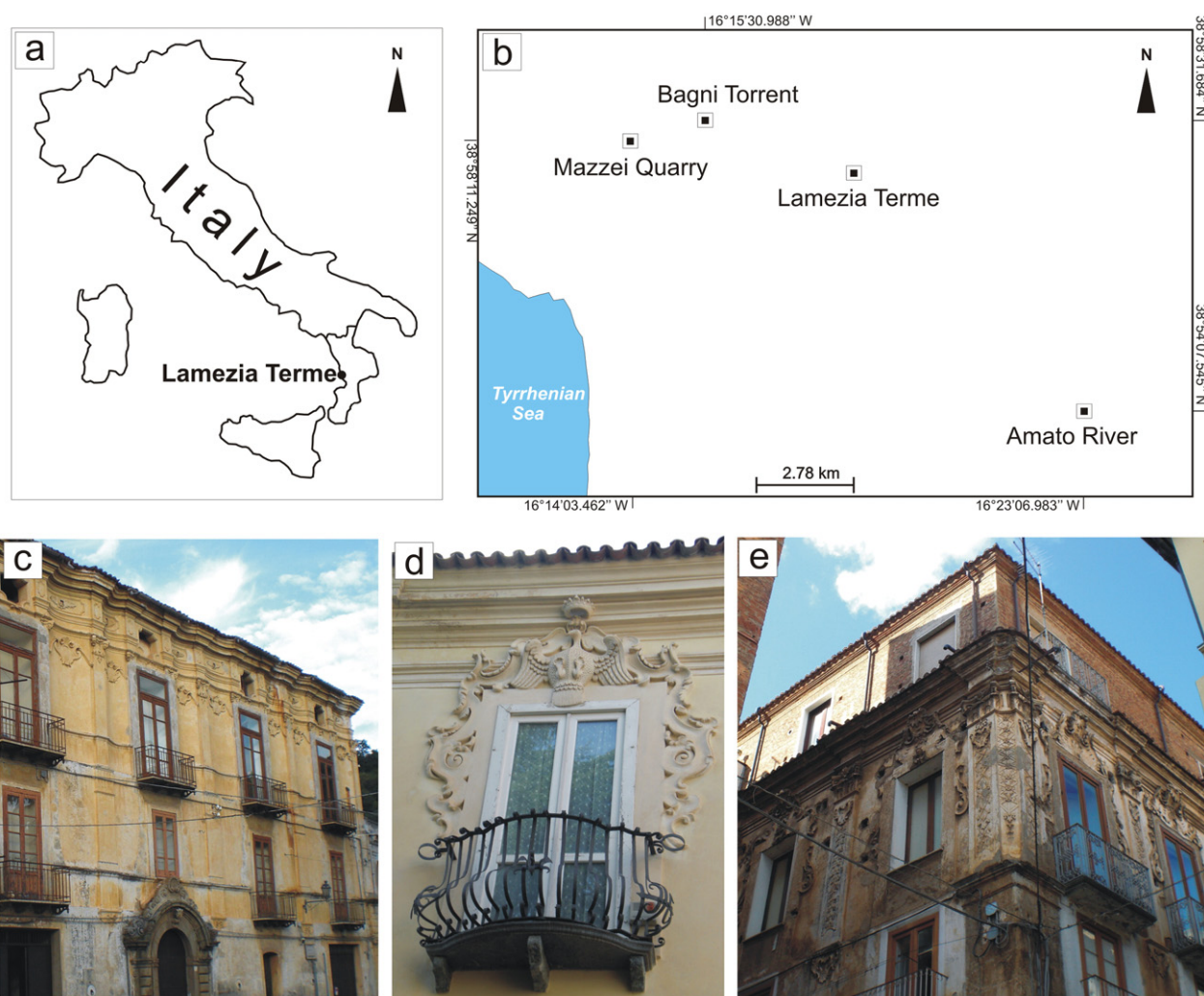
The main facade of Palazzo Cerra, in Sambiasi, is embellished with different decorative effects (Fig. 1e); the balconies show little heads in the middle and also the lodge in the courtyard presents rich decorations.

From these three buildings six samples of plaster were collected. The term "plaster" indicates an artificial stone material, composed of a mixture of lime, aggregates and water, used to finish the surface of a wall.

In addition, to study the provenance of the raw materials, geological samples of sand and limestone were also collected from the quarries near Lamezia Terme (Fig. 1b) and compared with the historical plasters. The samples were characterized with the aim of obtaining information on their production technique, the provenance of the raw materials and the constructive history of the buildings. Indeed the characterization of plasters and mortars can provide important archaeological information on historical and archeological monument, identifying their constructive phases, the technological process involved in their

\* Corresponding author.

E-mail address: [raffaella.deluca@unical.it](mailto:raffaella.deluca@unical.it) (R. De Luca).



**Fig. 1.** (a) Location of Lamezia Terme (Catanzaro, Southern Italy). (b) Localization of Mazzei Quarry, Amato River and Bagni Torrent, near the city of Lamezia Terme. (c) Principal facade of Palazzo Statti. (d) Particular of Palazzo Nicotera. (e) Particular of Palazzo Cerra.

manufacture and the provenance of the raw materials employed, as demonstrated by numerous works [4–12].

## 2. Materials and methods

A total of six plaster samples coming from Palazzo Statti, Palazzo Nicotera and Palazzo Cerra were studied (Table 1 and Fig. 2). Samples were taken from areas where processes of detachment have already started. The two samples of Palazzo Statti (MPS1 and MPS5) come from the second pilaster of the lateral facade (Fig. 2a). Samples MPN3 and MPN6 of Palazzo Nicotera were taken, respectively, in correspondence of a fresco of a decorative dossal in the courtyard and

on the lateral connecting elements of the dossal (Fig. 2b). The plasters coming from Palazzo Cerra were sampled in the inner courtyard (Fig. 2c); in particular, MPC2 was collected at the top of the stairs leading to the landing and MPC5 was taken at the base of the first arch of the lodge.

In addition to the historical plasters, one sample of limestone from Mazzei Quarry (CAV1) and two samples of sand coming from the Amato River (AM1) and Bagni Torrent (BA1) were collected (Fig. 1b).

All plaster samples were studied in thin section by polarized light microscopy, through a Zeiss Axioskop 40 petrographic microscope. The sorting of the aggregate has been defined by

**Table 1**

Historical plasters taken from three residential buildings of the 18th century in Lamezia Terme, with typology, location and historical period.

Sample	Typology	Location	Historical period
MPS1	Plaster	Palazzo Statti – lateral facade, pilaster	1763
MPS5	Plaster	Palazzo Statti – lateral facade, pilaster	1763
MPN3	Plaster	Palazzo Nicotera – fresco of a decorative dossal in the courtyard	1760–1780
MPN6	Plaster	Palazzo Nicotera – lateral connecting elements of the dossal in the courtyard	1760–1780
MPC2	Plaster	Palazzo Cerra – inner courtyard, top of the stairs	About 1760
MPC5	Plaster	Palazzo Cerra – inner courtyard, base of the first arch of the lodge	About 1760

Download English Version:

<https://daneshyari.com/en/article/1228715>

Download Persian Version:

<https://daneshyari.com/article/1228715>

[Daneshyari.com](https://daneshyari.com)