

Research programme on ceramic materials

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Clayey and ceramic materials have played a key role in human activities since prehistoric times. The widespread use of clays is due to their physical properties, such as the aptitude to be shaped and fired, but especially to their wide availability on the earth and to their low cost.

The study of material culture provides important insights into the intercultural and socio-economic system in ancient times. The circulation of pottery can be of fundamental importance in unravelling issues on old trading routes and connectivity. In the last years, research in this field has advanced considerably and the minero-petrographic approach for the archaeometric investigation of ceramic materials has become more and more common, proving its soundness in the study of provenance and production techniques, thus providing useful information for understanding the technological development of ancient cultures.

The research team at the Federico II University of Naples has been studying ceramics since 2005 in close cooperation with archaeologists of universities and institutions from Italy and from abroad. This has made it possible to carry out an intense programme of research focused on consumption, circulation, and technology of pottery, especially in the most popular archaeological sites of the Campania region of Italy, such as Pompeii, Cumae, Neapolis, Paestum, and many other production sites of pottery. The research team also gained experience studying ceramics from different Italian sites as well as pottery from Africa and Asia. These studies produced interesting results for the identification of ancient workshops and local pottery productions. A research program devoted to the characterization of clay deposits, mostly cropping out in the Campania region was carried out to better identify the ancient sites of procurement of clayey raw materials. This activity allowed the research team to obtain a large minero-petrographic database of a wide range of ceramic classes, from prehistory to middle ages, and raw materials as well

and led to the publication of several peer-reviewed papers on international journals and contributions on archaeological books.

The mineralogical-petrographic analytical techniques, typical of geosciences, are those that best manage to characterize this type of findings in terms of knowledge of supply areas of raw materials (clays and temper) and of the technological conditions at the time clay processing, shaping, and firing. This is based on the assumption that the fundamental constituent of ceramics is clay, a geomaterial properly processed by potters and fired at high temperature to harden following mineralogical and structural transformations. This approach is useful to obtain important information on ceramic provenance, in particular through the comparison with local raw materials, production indicators, and reference groups of already identified ceramic productions. Of course, possible processes (e.g., levigation, tempering) that could have modified the original compositions of clay raw materials must be also considered.

This project aims to improve the knowledge on archaeological pottery discovered in the Campania region, especially focusing on productive sites and raw materials procurement, to better investigate connectivity and exchanges in the socio-economic system of the investigated area in a wide time span. Also, the project aims to provide new information on ancient techniques of preparation of clay mixtures by using temper, clay mixing, and levigation via sedimentation. Ancient firing techniques such as temperatures, fuel consumption and redox condition of the kiln atmosphere will be also investigated via preparation of ceramic replicas by means of experimental firing and petrophysical investigation. This will also help us explore the technological properties of the various types of clays and mixtures depending on their end-use (tableware, cooking ware, bricks, etc.).

Some interesting results for provenance studies come from the Sr-Nd isotope analysis performed by the research team at the Federico II University. Isotopic systematic was implemented on selected Campanian archaeological pottery and local raw materials (clays and volcanic temper) and, for the first time, on experimental ceramic replicas. This pioneering study has demonstrated that

isotopes represent an effective fingerprint of pottery that strictly depends on the geochemical affinity of the raw materials. Further analyses in this sense are expected for testing this method on archaeological ceramics and raw materials from different sites.

The experience achieved on ceramics by the research team at the Federico II University has also been devoted to the study of present-day ceramic technology, of physical properties (resistance, porosity, colour, durability, etc.). Also, the technological process of production of traditional bricks in Madagascar has been investigated providing interesting results to understand the brick manufacture in one of the poorest African communities. The study can also have a positive impact beyond the scientific field, starting from raw material procurement, processing, and firing, up to the evaluation of the involved energies and quality of final products.

Proposal for a PhD position

A doctoral position will be applied for a candidate who can carry out research on a specific topic of archaeometric interest. The topic will be chosen among the most intriguing pending questions on archaeological pottery and should be completed within three years. The work programme will include the study of the available literature and a selection of pottery following a strategy carefully planned with the expert archaeologist(s) responsible for the materials. The analytical programme will be performed by using the instrumental facilities at the DiSTAR of the Federico II University, where the PhD student will have the possibility to acquire technical skills in mineralogical, petrographic and physical methods, such as chemical analysis (XRF), mineralogical analysis (XRPD), polarised light and scanning electron microscopy with microanalysis (EDS/WDS), spectroscopic techniques (Raman, FT-IR) and Sr-Nd isotope analysis. Training courses of the “Scuola di Dottorato” will be also available for the student at the host University for improving its knowledge on different topics.

A period of about 5 months for a visiting fellowship abroad is also included in the work programme for the PhD student to learn different analytical methods and to make useful discussion with other scholars, to have the possibility to develop further its career.

Progetti

Responsabile dell'accordo quadro tra l'Università degli Studi di Napoli Federico II e la Soprintendenza Speciale per i Beni Archeologici di Pompei, Ercolano, Stabia per lo svolgimento di attività di ricerca e didattica finalizzata alla valorizzazione, fruizione, divulgazione del sito di Pompei dal 2018 al 2021. Prot. n.

Responsabile dell'accordo quadro tra l'Università degli Studi di Napoli Federico II, la Soprintendenza Archeologica della Campania ed il Segretariato Regionale per i Beni e delle Attività Culturali e Turismo per la Campania per lo svolgimento di attività di ricerca e didattica finalizzata alla valorizzazione, fruizione, divulgazione del sito di Pompei dal 2018 al 2021