Egyptian ‘Pastes’: The definition, investigation and significance of plaster-like materials on coffins and other objects

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A range of plaster-like materials is found in association with coffins and other ancient Egyptian objects. They are used, for example: as key components of cartonnage, for casting complete objects, for gap-filling in wooden constructions and for modelling, as bedding adhesive for inlays, for creating fine detail and as a substrate for painting and gilding.






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These materials can include true plasters made from lime and gypsum cements but also mud, calcium carbonate and calcium sulphate-based pastes mixed with a variety of binding media. Sometimes, mixtures of all these materials can be present, together with clay minerals and vegetable fibres.

The imprecise terminology applied historically and currently, in the Egyptological literature to such materials, creates the problem of interpreting what sort of material is actually under discussion.

MORTAR GYPSUM WHITING GESSO CHALK STUCCO PLASTER

are examples of terms used indiscriminately, with or without technical analysis. In the Fitzwilliam Museum coffins' project, '**PASTE**' has been adopted as a term which can cover all these materials without implying any specific chemistry or technology.

Whilst architectural pastes have received more detailed attention in analytical work, in the literature there is still a very limited number of
in-depth imaging and analysis examples of these materials as found on objects.

When identified, they are most often reported simply as, for example, a calcium carbonate or calcium sulphate or maybe a mixture of the two.

The potential of more detailed characterization to contribute to understanding of technological development, object context and provenance investigation remains, therefore, largely unexplored.

AIMS OF THE PROJECT

- To explore an analytical protocol for analysis of the organic and inorganic components in pastes used in the creation of Egyptian objects
- To use the protocol to undertake the detailed chemical, elemental, microstructural and mineralogical characterization of different pastes
- To apply this information to understanding the development of the technology and working properties of different pastes
- To work towards improved definitions and descriptions of pastes
- To investigate what these materials and the differences between them can reveal about workshop practice and broader aspects of funerary culture and social conditions

THIRD INTERMEDIATE PERIOD COFFINS

The first phase focuses on two coffin sets of the Third Intermediate Period:

The yellow coffins set of Nespawershefyt is made up of parts of recycled coffins and is characterized by the presence variously across the three elements of the set of mud and pink calcite filler pastes together with white calcite relief modelling and ground layers as a substrate for the painted decoration.

Coffin set of Nespawershefyt, about 1000 BCE
Fitzwilliam Museum E.1.1822

THIRD INTERMEDIATE PERIOD COFFINS

The first phase focuses on two coffin sets of the Third Intermediate Period:

The coffins of Pakepu also have pink filler paste. The intermediate coffin surface is then covered in a simple white calcite paste. But on the inner, bivalve coffin there is a complex layering reminiscent of cartonnage, constructed over a thick layer of ‘fibrous glue’ which lies directly on the wooden surface.

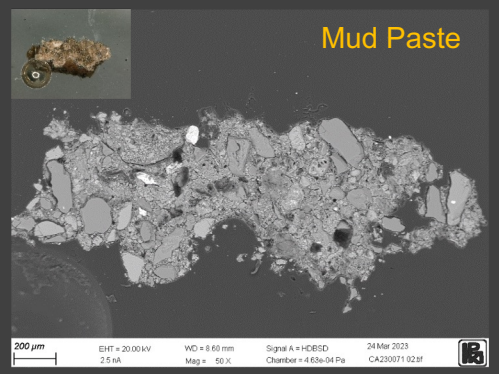
Coffin set of Pakepu, about 680–664 BCE
Fitzwilliam Museum E.2.1869

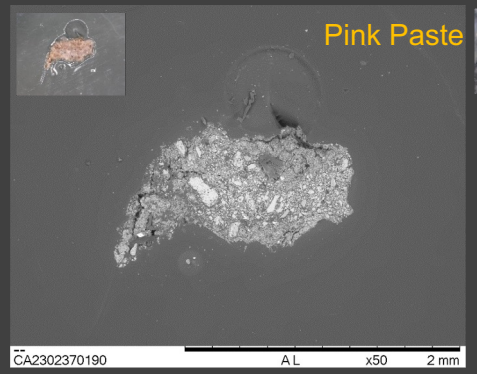
ANALYTICAL PROTOCOL

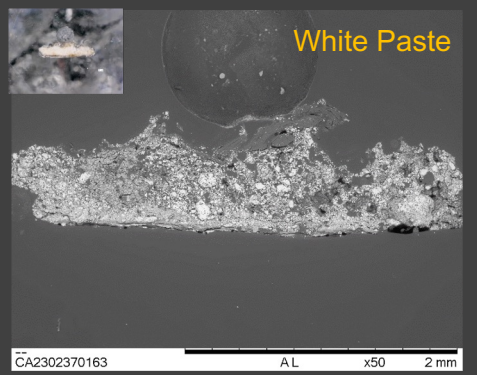
1. MICROSCOPY (Optical Microscope and SEM-EDS):

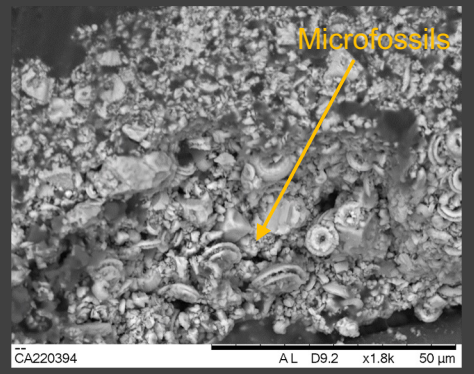
The SEM-EDS is used for 3 different purposes:

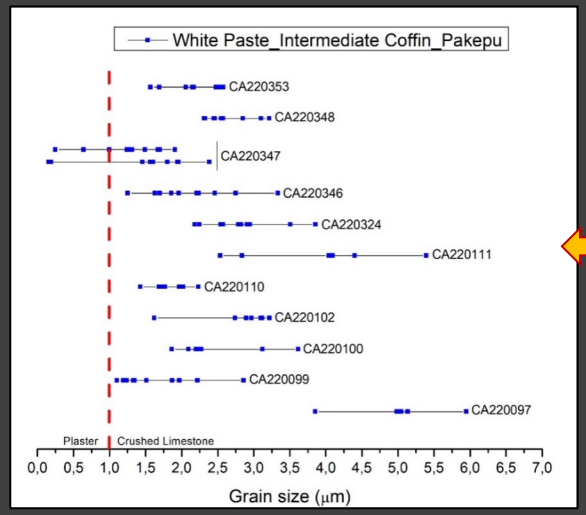
1. To show microscopic morphological features of the grains of the different pastes. White and pink paste dominated by cubic calcite grains, while mud paste by a clay-like texture. Identification of specific microfossils, where present, can help with determining provenance of the rock source.

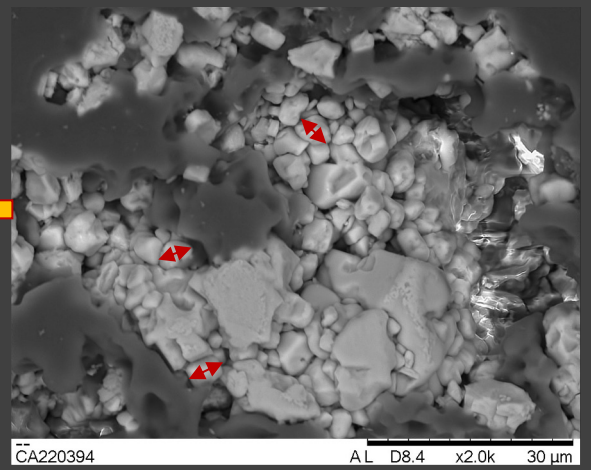




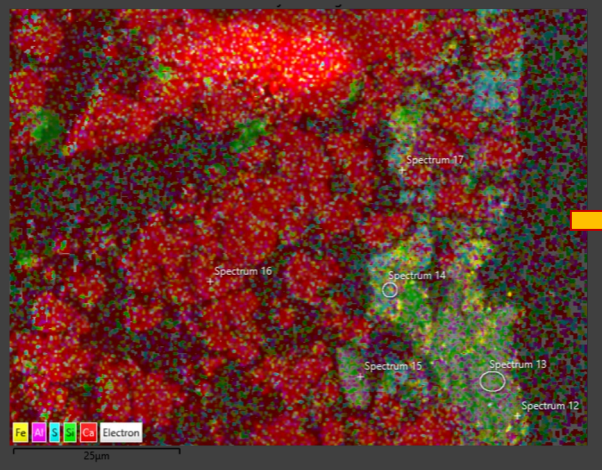


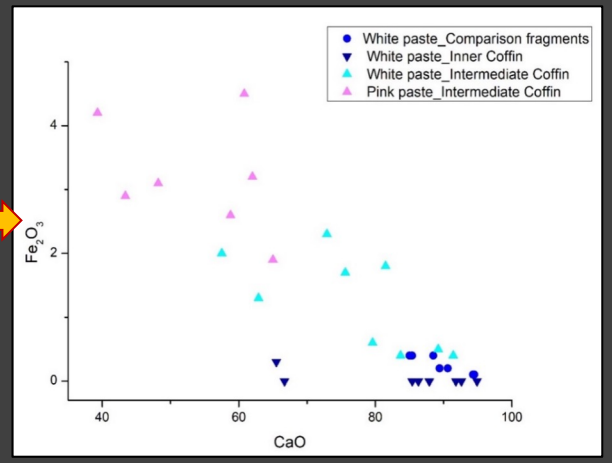






2. To measure the size of the grains to define the pyrotechnology (real plaster <1µm)



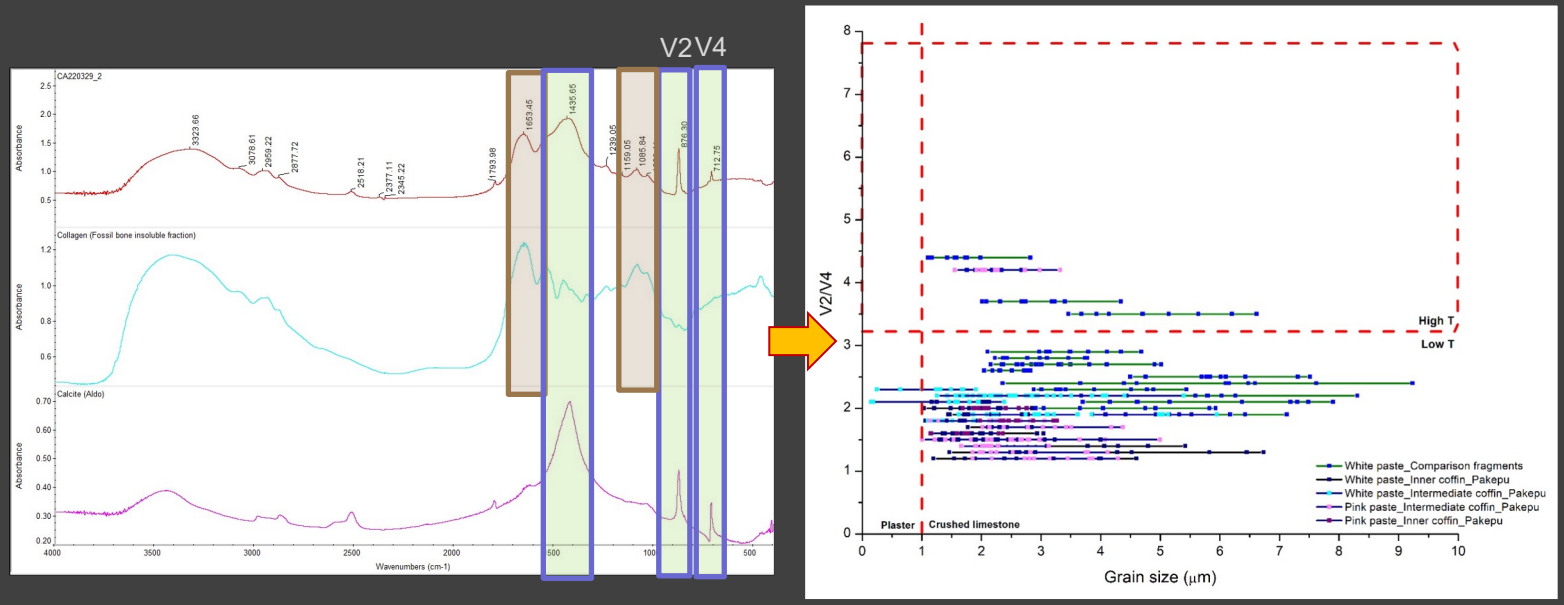


3. Coupled with an EDS detector, to determine the elemental composition.

ANALYTICAL PROTOCOL

3. FTIR:

FTIR can distinguish between different organic and inorganic materials and confirm any pyrotechnology of pastes by means of the v2/v4 ratio.



Graph representing the relationship between the FTIR data (V2/V4) and the SEM grain size, to evaluate if there is a coherent distribution of the pyrotechnology results.
Almost all the samples are reported with a grain size smaller than 1µm and with a V2/V4 ratio smaller than 3.3.

ANALYTICAL PROTOCOL

4. PALEOPROTEOMIC ANALYSIS:

MALDI-TOF MS and LC-MS/MS provides information on the production stages employed in the creation of the organic materials and the animal species.