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Comparative Study of Technique, Treatment and Conservation of Wooden & Cartonnage Funeral Masks in Ancient Egypt Applied on Selected Models

Ph.D Thesis Submitted by

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SUMMARY

The thesis "Comparative Study of Technique, Treatment and Conservation of Wooden &Cartonnage Funeral Masks in Ancient Egypt Applied on Selected Models" consists of six chapters.

Chapter I:Study of Materials & Technique of wooden Funeral Masks inAncient Egypt.

This part deals with materials which wooden masks consist of (support, preparing layer, painting layer). Linen was used sometimes on wooden mask support aspreparing layer, but was not common. This part had been explained wood properties (physical, chemical and mechanical), defects of wood and wood species used in ancient Egypt.Also had been studied materials of preparing layer and painting layer. At the end, steps ofthe manufacture technique of wooden masks were mentioned.

Chapter II: Study of Materials &Technique of cartonnageFuneral MasksinAncient Egypt.

This sectionexplained the sequence of cartonnage masks technique in ancient Egypt,mentionedcartonnage masks support (linen, papyrus) and their properties (physical, chemical and mechanical),also preparing layer (gypsum, calcite) and painting layerwhichconsists of (pigments, Dyes and media). Methods of decorative by gilding, inlaying, painting, applying varnish and their materials were studied.

Chapter III:Studyof deteriorationfactors and phenomenaofwooden and cartonnage masks.

This chapter concerns with internal and external deterioration factors and phenomenaof wooden and cartonnage masks, like brittles, weakness, deformation, twisted, cracks, broken and missing parts. Internal deterioration Factorsincluded defects of support, preparing layer,

painting layer,joints, inlaying, varnishlayer and defects of embalmment mummy materials. Externalfactorsinclude(before and after discovering). Factors after discovering were physical factors such as (humidity, temperature, and light), chemical factors (air pollutants), biological factors (insects, bacteria and fungi) and human deterioration.

<u>Chapter IV</u>: Treatment and conservation Methods of wooden and cartonnage masks.

It presented the best plan for treatment and conservation of wooden and cartonnage masks. That plan had eight stages:

1- Studies which precede treatment and documentary,

2- Examination and analysis,(microscopic, biological investigations), and analysis of mask components (wood or textile spices, pigment, media analysis).

3- Pre consolidation and safety,

4- Cleaning, (Mechanical and chemical cleaning)specially with laser and nanomaterial techniques.

5- Treatment of support,

* Treatment of the microbiological damage (insects, bacteria, fungi).
* Consolidation of support with polymers and nanomaterials.
* Completion method of missing parts.

6- Treatment of painting layer.

7- Isolation.

8- Conservation and exhibition,

* Controlling the environmental surrounding conditions (humidity, temperature, light, inhabit pollutant)
* The best method for exhibition of wooden and cartonnage masks.

<u>Chapter V:</u>Studyof selected Funeral Masks.

This chapter dealswith studying three funeral masks in Saqqara:

1) First mask (wooden mask):The wooden support was made from ficussyacamorus and pigs were made of Tamarisk Aphylla.
2) Second mask (wooden cartonnage mask): Wooden support was made from ficussyacamorus and layer of linen.
3) Third mask (cartonnage mask) : the support was made from linen
   - Microbiological investigation: 21 kinds of fungi and 3 kinds of bacteria were identified on the masks and storage air.
   - Analyses of pigments for masks were carried out by using x-ray-diffraction and EDX. All of these analysis proved that the pigments were Calcite, Carbon, Egyptian Blue, Hematite,Orpiment, Gold and Nantokite.
   - The three masks had been analyzedby absorbance and reflection I-R and Gas Chromatography mass spectrometer(GC-MS) to ensure that the medium which was used with pigments was only animal glue or was mixed with arabic gum or egg.
   - Dating with radioactive Carbon 14 and with Electron Spin Resonance Spectroscopy (ESR)of the third mask was carried out.

<u>Chapter VI:</u>Experimental and applied study of selected Funeral Masks.

This chapter isdivided into two parts: Experimental study&Applied study.

A)Experimentalstudy:

It includes five parts as follows:

1- Inhibition of microbial growth on ancient Egyptian funeral masks with nanomaterials(Ag, TiO_2, CuO NPS), Data showed that Ag NPS was the best one.

2- Usingnanomaterials(Ag, SiO2, TiO2 and ZnO NPS), polymers for consolidating wood (Regalers 1026, poly propylene glycol and methylmetha acrylate co-polymer di ethylene glycol metha acrylate) and polymers for consolidating linen experimental samples,

(Kulocel G, poly propyleneglycol and mthylemetha acrylate co-polymer di ethylene glycol metha acrylate).

It was found thatZnO 1% was the best nanomaterial and methylmetha acrylate co-polymer di ethylene glycol methaacrylate wasthe best polymerwith 5% to linen and 7% for wood. Mixture ofnanomaterialsand polymers produced methyl methaacrylate co-polymer di ethylene glycol methaacrylate withZnO NPS 1%was the best and the same polymer with Ag NPS had almost equal results.

3- Results provedthat the completing materials were:

- Linen paper was the best for completing small partsin case of cartonnage masks.
- A mixture of methylmethaacrylate co-polymer di ethylene glycol methaacrylate 20% with cellulose powder 15%, ZnO NPS 1%and microballon10% was the best of completing preparing layer for cartonnage masks.
- A mixture of methylmethaacrylate co-polymer di ethylene glycol methaacrylate 20% withequal weight of both ficussyacamorus powder and microballonwas the best for completing small parts of wooden masks.

4- Experimental adhesive results showed that10% gelatin with 1%Ag NPS was the best for linen andplexysol 550 was the best for wood.

5- TiO_2 0.5% was the best for protectingpigments from UV.

B)Appliedstudy:

All of the previous results were applied for restoration and conservation of the three masks from Saqqaraas follows:

First mask: including microbial treatment, consolidation of the support, fixing painting layer and completed wide crack between eyes.

Second mask: Microbial treatments, consolidation of the support, fixing separated part, adhesive cartonnage layer, protection ofedges of preparing and painting layer and completed missing parts.

Third mask: Microbial treatments, reconstruction and reshaping, consolidation of the support, and the painting layer, completion of missing parts, addition of new support for weak parts and colored completed area with acrylic pigments.

At the end the three masks exhibitedonthree plexy glass supports.

Key Words:

Wooden funeral masks.
Cartonnage funeral Masks.
Support of Funeral wooden and Cartonnage masks.
Technique of funeral masks.
Wood.
Linen.
Papyrus.
Restoration of funeral masks.
Nanomaterials.
Exhibition of funeral masks