

## **Ancient Egyptian Industry Technology of Canopic Jars, Analytical Study and Conservation Processes of Limestone Canopic Jar**

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**Abstract :** Canopic jars made by the ancient Egyptians from different materials were used to preserve the viscera during the mummification process. The canopic jar studied here dates back to the Late Period (712-332 BC). It is found in the Grand Egyptian Museum (GEM), Giza, Egypt. This jar was carved from limestone and covered with a monkey head lid with painted eyes and ears with red pigment and surrounded with black pigment. The jar contains bandages of textile containing mummy viscera with resin and black resin blocks. The canopic jars were made using the sculpting tools that were used by the ancient Egyptians, such as metal chisels (made of copper) and hammers and emptying the mass of the jar from the inside using a tool invented by the ancient Egyptians, which called the emptying drill. This study also aims to use analytical techniques to identify the components of the jar, its contents, pigments, and previous restoration materials and to understand its deterioration aspects. Visual assessment, isolation and identification of fungi, optical microscopy (OM), scanning electron microscopy (SEM), X-ray fluorescence spectroscopy (XRF), X-ray diffraction (XRD), and Fourier transform infrared spectroscopy (FTIR) were used in our study. The jar showed different signs of deterioration, such as dust, dirt, stains, scratches, classifications, missing parts, and breaks; previous conservation materials include using iron wire, completion mortar and an adhesive for assembly. The results revealed that the jar was carved from Dolomite Limestone, red Hematite pigment, Mastic resin, and Linen textile bandages. The previous adhesive was Animal Glue and used Gypsum for the previous completion. The most dominant Microbial infection on the jar was found in the fungi of (*Penicillium waksmanii*), (*Nigrospora sphaerica*), (*Actinomycetes* sp) and (*Spore-Forming Gram-Positive Bacilli*). Conservation procedures have been applied with high accuracy to conserve the jar, including mechanical and chemical cleaning, re-assembling, completion and consolidation.

**Keywords :** Canopic jar, Consolidation, Mummification, Resin, Viscera.

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