CONDITION ASSESSMENT OF OIL BASED PAINTED STONE SURFACES; A CASE STUDY FOR TREATMENT AND CONSERVATION OF A 19th CENTURY PAINTED DOME IN CAIRO

By

Souty Adel NassefBeskhyroun

A Demonstrator- Conservation Department-
Faculty of Archaeology- Fayoum University

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ABSTRACT

In this thesis, **Chapter I** discusses the history of oil wall paintings in Europe and how this fairly modern technique was transferred to the Middle East and Egypt since Mohammed Ali Pasha era. Oil painting techniques adorned the walls and the ceilings of a number of the historical royal palaces, mosques and churches with natural, legendary, religious scenes, geometric decorations and urban panoramas. This chapter also discusses the techniques of oil wall paintings found in the Egyptian historical examples and how the stratigraphy of these techniques fairly differed from their traditional ones.

Chapter II this chapter discusses the chemical properties of the drying oil medium and pigments through which the chemical reactions of organic medium and/or the inorganic pigments with either the surrounding uncontrolled environment or usage of inappropriate conservation materials could be easily expected. This chapter also includesthe mechanisms of chemical and physical changes of oil paints. This chapter also includes an interpretation of the possible chemical reactions and change of physical appearance occurred in drying oil mediums and pigments as a result ofthe used painting materials, manufacturing methods, uncontrolled environmental condition and incompatible treatments which may lead to their degradation.

Chapter III includes the practical and experimental studies that were carried out to investigate the aspects of physical, chemical and mechanical changes in oil wall paintings of the selected dome.This chapter includes the investigation of oil painted dome of Archangel Gabriel church which has been selected due to its overall darkening in appearance. The study included the investigation of the dome stratigraphy, the variety of the used drying oil, pictorial palette, and deterioration products with the aim of assessing its present state of conservation to finally justify the treatment procedures. Cross sections, Stereo microscopy, Scanning electron microscopy coupled with the dispersive energy of X-ray spectrometer, Multi-spectral imaging, Fourier transformed infrared spectroscopy, Gas chromatography-Mass spectroscopy, X-ray fluorescence, X-ray diffraction, colorimeter, Gas samplers, Data loggers and the colorimetric measurements were employed for technical analysis and assessment the present conservation state of the dome. In this context, experimental samples were prepared with the same stratigraphy of the dome and subjected to thermal and UV artificial aging with the aim of understanding the deterioration mechanisms of oil paintings and studying the effect of conservation materials with the efficiency of their applications on the physical appearance. To study the physical and

chemical deterioration aspects of oil paints, a group of common pigments used during the 19th and 20th were selected and were subjected to UV artificial/natural aging and salt weathering. Microscopy, colorimetric measurements, and multi-spectral imaging, FTIR, XRD and Raman Spectroscopy were carried out to diagnose the physical and chemical changes of paints before and after aging. The experimental study showed that the chromatic change of the painted layer was mainly affected by either the oxidation of the binding medium, the reaction of the binder with the pigments to form metal soaps or by the chemical change of the pigments. The chromatic change could be visually discernible or easily be recognizable by the colorimetric measurements.

Supervised by

Prof. Dr.Gamal Abdel MageedMahgoub

Dr. AbdelrazekElnaggar

Dr. Austin Nevin