بسم الله الرحمن الرحيم

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تم رفع هذه الرسالة بواسطة / هناء محمد علي

بقسم التوثيق الإلكتروني بمركز الشبكات وتكنولوجيا المعلومات دون أدنى مسئولية عن محتوى هذه الرسالة.

ملاحظات: ....

Cairo University
Faculty of archaeology
Conservation department

Study of Iron Compounds' Effect on the Deterioration of Paint Layer in Wall Paintings and Reliefs, Treatment and Conservation Methods "Applied on a Selected Object"

A thesis submitted for the fulfilment of a master's degree in Conservation of Monuments

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Abstract

One of the challengeable problems of the archaeological wall paintings in Egypt is the black crusts that formed on the paintings' surfaces. According to the literature, black crusts appear in different shapes of regular and irregular layers depending on the host place's formation and microclimatic environmental factors. The danger of the black crusts phenomenon resides in distorting the beauty of historical paintings and unique valuable places of economic importance. This black crust phenomenon appears clearly in the Bannentiu tomb, an ancient Egyptian tomb back to the 26th dynasty in the Bahariya oasis, one of the main iron ores in Egypt's western desert. The black crusts are attributed to the high content of Fe and Mn oxides and oxyhydroxides components in the sandstone host rock formation as cement materials. The present study aims to analyze and categorize the chemical composition and mineralogy of the black crusts formed on the wall paintings of the Bannentiu tomb. Nondestructive investigations were carried out for the collected samples using optical microscopy, XRD, XRF, AFM, FTIR, color Spectrophotometer, and SEM–EDX analyses. The observed results indicate that silica, iron, manganese compounds, clay minerals, and other remaining elements classify the black crusts as one of the rock varnish species.

Moreover, the study proposes a model formation for the rock varnish on the Bannentiu tomb wall painting. The proposed simulation relies on high ratios of Fe and Mn in the host rock and the microclimatic factors that cause the migration of these elements to the surface, with the oxidization factors giving rise to oxides and hydroxides' low crystallinity. In the practical part of the study, the study of the formation of iron oxides and the mechanical damage that occurred through them by various methods, according to previous studies and the diagnostic study results. And the effect of the multiple mechanics and compositions of rock varnish on wall paintings' samples and the deterioration of pigments under study.

Furthermore, the microbiological aspect of the study, where microorganisms were grown in multiple environments, separated, and purified, identified microorganisms from swabs that were taken from the surfaces of murals. The final part of the experimental study includes Conservation methods, interventional and preventive treatment of murals and layers of rock varnish. At the end of this study, recording, documentation, sterilization, cleaning, and conservation of the Bannentiu tomb were carried out due to the results of the experimental studies.

Keywords

- *Rock Varnish*
- *Desert Varnish*
- *Ferromanganese crust*
- *Black crusts*
- *Wall paintings deterioration*
- *Iron-rich Sandstone*
- *Manganese-rich Sandstone*
- *Bahariya Oasis*
- *Bannentiu tomb*
- *Wall paintings Conservation*

Dedication

I would like to dedicate this work

To my parents, sisters, and my nephews Lara and Emma

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