



**Physico-chemical treatment for the deteriorated writings of metallic
gallotannin inks in archaeological paper manuscripts and documents -
Applied to selected models**

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Abstract

The thesis dealt with its topic "Physico-chemical treatment for the deteriorated writings of metallic gallotannin inks in archaeological paper manuscripts and documents -Applied to selected models" through four main chapters, including the theoretical framework in its first three chapters, experimental procedures and application in its fourth and final chapter, **The first chapter** included the main and secondary materials required for the obtainment of metallic- gallotannin inks complexes and their reactions to obtain the different types of their chemical recipes and other specific cases, While **the second chapter** discussed the mechanisms and interactions of inks deterioration through eight types that highlight the different forms of physico- chemical degradation of the inks studied, As for **the third chapter** dealt with the methods, techniques and materials for the physico-chemical treatment of the writings and their substrates in accordance with the forms and manifestations of degradation contained of them and the second chapter submitted in advance, within three main axes with precise identification of its advantages and disadvantages according to the views and theories of their users , conservators and chemists in this regard.

In addition, **the fourth chapter** of the research included studies and experiments in the first part of the study, like of degradation and treatment of metallic- gallotannin inks, and the detection of forgery and counterfeiting of writings carried out using it by monitoring, measurement and evaluation through evaluating experiments for studies that have been conducted before, and some new ones depend on the topics of physico-chemical degradation common to this type of inks, and others put their theories for the first time in this field, wishing their compatibility with the laws of the protection of antiquities and archaeological manuscripts & documents, and then apply - on the second side - the results of these experiments after evaluating using available tools, and their suitability for the purpose of each study to treat two models from the Mamluk and Ottman periods, all of which concluded the discussion of the results of their theoretical studies and experiments.

The previous four chapters have been presented with the annexes of the thesis like the four indexes and a statement for the purpose of the research, introduction of its subjects, summary in arabic, as well as previous studies of the research subjects or related topics, as well as a list of citation sources and references, and a summary in english when completed and ended.

Key Words

- Metallic-gallotannin inks.
- Oxidation.
- Free radicals.
- Acidic hydrolysis.
- Physico-chemical treatment.
- Transition metal ions.
- Anti-Oxidants.
- Acidity neutralization.
- Nanoparticles.
- Forgery and Counterfeiting.