**Ain Shams University**

**Faculty of Science**

**Chemistry Department**

# Utility of Variable Analytical Methods for Micro Determination of Some Antidepressant

**ATHESIS**

Submitted

By

**Emam Ahmed Ali Mohammad**

M.Sc. Chemistry (2011)

Submit for the degree of doctor of philosophy in science
(Analytical Chemistry)

Chemistry Department

Faculty of Science

Ain Shams University

Cairo- Egypt

**2016**

**Ain Shams University**

**Faculty of Science**

**Chemistry Department**

# Utility of Variable Analytical Methods for Micro Determination of Some Antidepressant

**ATHESIS**

Submitted By

**Emam Ahmed Ali Mohammad**

Submit for the degree of doctor of philosophy in science
(Analytical Chemistry)
This Thesis has been approved for submission by the supervisors

Prof. Dr. **Mohamed .F. El-Shahat** ……..
Prof. of Analytical and Inorganic Chemistry
Faculty of Science, Ain Shams University
Prof. Dr. **Alaa .S. Amin** …….
Prof. of Analytical Chemistry
Faculty of Science, Benha University
Dr. **Ahmed.M. Adawi** ……..
Expert of Toxicology and Drugs
Director of Beni-Suef lab- Forensic Medical Authority-
Ministry of justice

Head of Chemistry Department
Faculty of Science Ain Shams University

**Prof. Dr.** Ibrahim.H.A.Badr

## *ACKNOWLEDGMENT*

First and foremost thanks are due to Allah, the most beneficent, unlimited and continuous blessing on me, and for all gifts He gave to me.

I wish to express my deepest gratitude and great thanks to Prof. Dr. M. F. El-Shahat Professor of Inorganic and Analytical Chemistry, Chemistry Department, Faculty of Science, Ain Shams University and prof. Dr. Alaa S. Amin. professor of Analytical Chemistry, Chemistry Department and Dean of the faculty of Science, Benha University, for suggesting the problem, supervision, precious suggestion and valuable discussions which were so willingly given throughout this work.

I wish also to express my sincere gratitude and special appreciation to Dr. Ahmed Mohammad Adawi expert of Forensic Chemistry, Medico-legal department, Ministry of Justice and Dr. Ahmed Shahat Ahmed, Associate Professor, Chemistry Department Faculty of Science, Suez University, Suez – Egypt, for sincere supervision, precious suggestion and valuable discussion which were so willingly given throughout this work. My deepest gratitude to all colleagues and staff members of Chemistry Department, Faculty of Science, Ain Shams University

**Emam Ahmed Ali**

# Abstract

This thesis contains three main parts. The first part includes a simple and sensitive spectrophotometric method for determination of Tramadol hydrochloride, Mianserin hydrochloride, Fluoxetine hydrochloride, Clomipramine hydrochloride and Dothiepin (Dosulepin) hydrochloride through ion-associates formation with phenol red (PhR), cresol red (CR), bromocresol green (BCG), metanil yellow (MY), methyl orange (MO) and bromothymol blue (BTB). The absorbance of each ion-associate was measured at maximum wavelength. Different factors were studied as pH, temperature and interfering ions to establish the best conditions for the determination. Comparison of the results of the proposed methods with those of official ones and complete validation study were also performed. The second part is based on thin layer chromatography methods for the detection of the above drugs. This method is analytical technique for the separation and identification of drugs due to its simplicity (it requires a less sophisticated apparatus), low cost, and need for minimal sample cleanup.

The third part is spectrophotometric method based on second order derivative for simultaneous determination of Tramadol

hydrochloride (TD) and Clomipramine hydrochloride (CLO) in combined dosage form and in some biological samples. The proposed method was found to be simple and sensitive for the routine quality control application of TD and CLO in biological samples.

The fourth part is spectrophotometeric methods for detection of ultra-traces of some toxic metal ions such as Cu (II), Pb (II), Hg (II) and Cd (II) in post-mortem biological samples. The procedure depends on single-step detection and removal for metal ions based on dithizone (Dz) anchored on mesoporous TiO2 with rapid colorimetric response and high selectivity for the first time. Statistical comparison of the results with the reference method shows excellent agreement and indicates no significant difference in accuracy and precision.

**Key words:** Tramadol, Mianserin, Fluoxetine, Clomipramine and Dothiepin (Dosulepin) hydrochloride spectrophotometry, ion-associates complexes, thin layer chromatography, Copper, Mercury, Lead, Cadmium and Mesoporous.

**List of abbreviations**

| Abbreviation | Full name |
|---|---|
| BTB | Bromothymol blue |
| BCG | Bromocresol green |
| CLO | Clomipramine hydrochloride |
| CR | Cresol red |
| DAD | Diode-array detector |
| DO | Dothiepin (Dosulepin) hydrochloride |
| DZ | Dithizone-probe |
| FESEM | Field Emission Scanning Electron Microscopy |
| FLU | Fluoxetine hydrochloride |
| GC | Gas chromatography |
| HPLC | High performance liquid chromatography |
| HR-TEM | High resolution transmission electron microscope |
| LOD | Limit of detection |
| LOQ | Limit of quantification |
| MY | Metanil yellow |
| MO | Methyl orange |
| MIN | Mianserin hydrochloride |
| PhR | Phenol red |
| RSD | Relative standard deviation |
| TLC | Thin layer chromatography |
| TD | Tramadol hydrochloride |

# CONTENTS

## LIST OF FIGURES