بسم الله الرحمن الرحيم

MONA MAGHRABY

شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم

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شبكة المعلومات الجامعية

التوثيق الإلكتروني والميكروفيلم

جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
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MONA MAGHRABY

Chemistry Department-Faculty of Science

Kinetic Studies of Drug Released from Polymeric Nanocomposites Using Advanced Analytical Techniques

Thesis submitted by

Heba Maher Ramadan Abdelrazik

B.Sc. (Special chemistry) (2009)

M.Sc. (Analytical chemistry) (2014)

For the requirement of Ph.D. Degree of Science in Chemistry

Prof. Dr. Saad Elsayed Mohammed

Prof. of Analytical chemistry, Faculty of Science, Ain Shams University

Prof. Dr. Ayman Helmy Kamel

Prof. of Analytical chemistry, Faculty of Science, Ain Shams University

Prof. Dr. Elsayed Mohamed Abd El-Bary

Prof. of Organic chemistry, Faculty of Science, Mansoura University

To

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By

Heba Maher Ramadan Abdelrazik

Thesis Advisors ***Approved***

Prof. Dr. Saad Elsayed Mohammed **…….**

Professor of Analytical Chemistry- Faculty of Science

Ain Shams University

Prof. Dr. Ayman Helmy Kamel **…….**

Professor of Analytical Chemistry- Faculty of Science

Ain Shams University

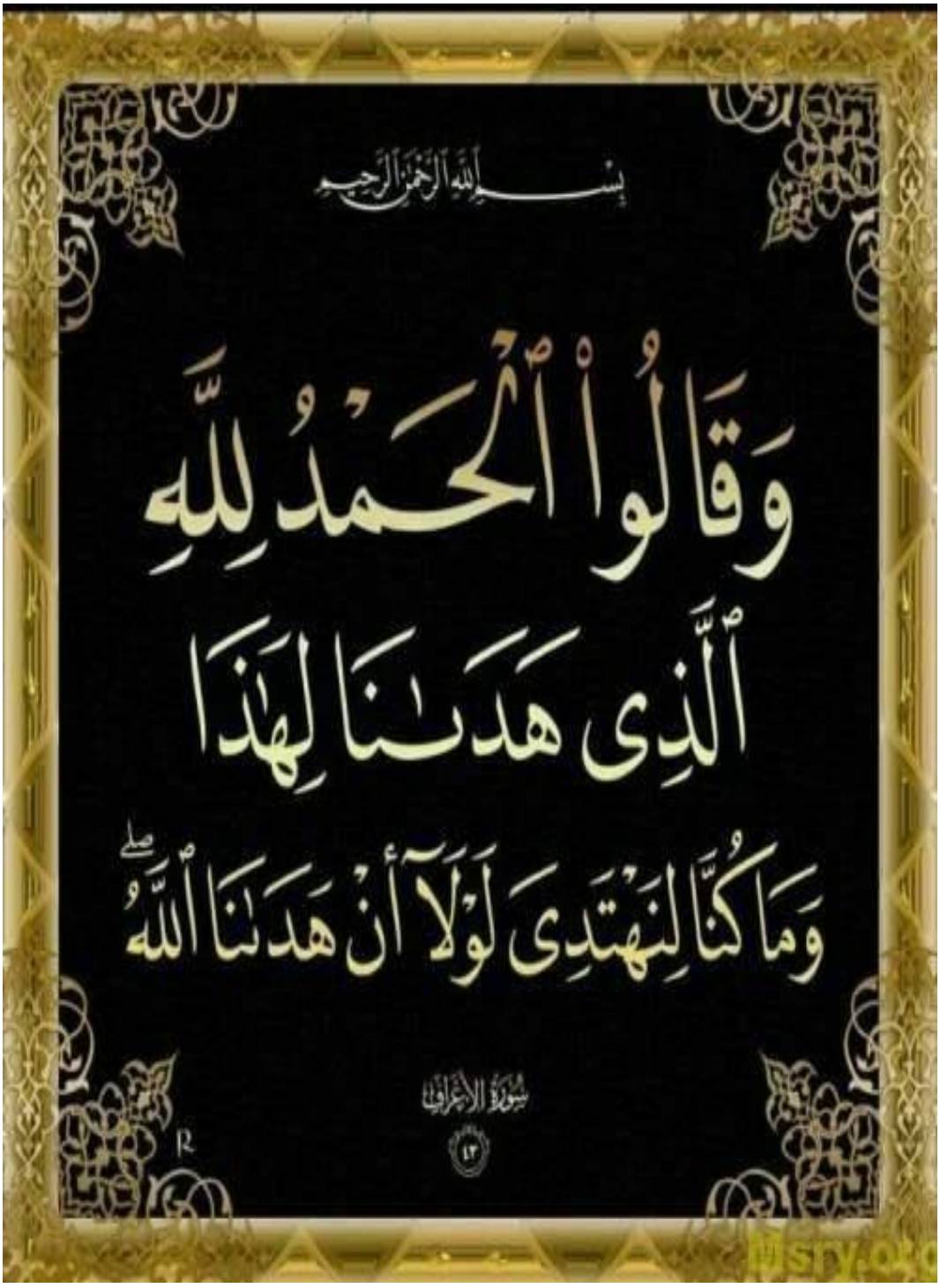
Prof. Dr. Elsayed Abd El-Bary **…….**

Professor of Organic Chemistry- Faculty of Science

Mansoura University

Head of Chemistry Department

Prof. Dr. Ayman Ayoub Abdel-Shafi


بسم الله الرحمن الرحيم
وَقَالُوا الْحَمْدُ لِلَّهِ
الَّذِي هَدَانَا لِهَذَا
وَمَا كُنَّا لِنَهْتَدِيَ لَوْلَا أَنْ هَدَانَا اللَّهُ
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١٣

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- *Cost-Effective Potentiometric Platforms Modified with Multi-Walled Carbon Nanotubes (MWCNTs) and Based on Imprinted Receptors for Fluvoxamine Assessment,* ***Polymer,*** *2020.*

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- *Imprinted Polymeric Beads-Based Screen-Printed Potentiometric Platforms Modified with Multi-Walled Carbon Nanotubes (MWCNTs) for Selective Recognition of Fluoxetine,* ***Nanomaterials****, 2020.*

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- *Drug delivery systems between metal, liposome, and polymer-based nanomedicine: A review,* ***European chemical bulletin****, 2020.*

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- *A comparative study of transduction mechanisms of different transducing materials for solid contact -ISEs: Application to Venlafaxine drug assessment,* ***under submission****.*

- *Characteristics and Cell Toxicity Assessment of Venlafaxine - Electrospun Composite Nanofibers for Buccal Drug Delivery Systems,* ***under submission****.*

polymers

MDPI

Article

Cost-Effective Potentiometric Platforms Modified with Multi-Walled Carbon Nanotubes (MWCNTs) and Based on Imprinted Receptors for Fluvoxamine Assessment

Heba M. Hashem [1], Saad S. M. Hassan [1,*], Ayman H. Kamel [1,*], Abd El-Galil E. Amr [2,3,*] and E. M. AbdelBary [4]

[1] Chemistry Department, Faculty of Science, Ain Shams University, 11566 Abbasia, Cairo, Egypt; hebahashem426@yahoo.com

[2] Pharmaceutical Chemistry Department, Drug Exploration & Development Chair (DEDC), College of Pharmacy, King Saud University, Riyadh 11451, Saudi Arabia

[3] Applied Organic Chemistry Department, National Research Center, 12622 Dokki, Giza, Egypt

[4] Chemistry Department, Faculty of Science, Mansoura University, 35516 Mansoura, Egypt; ebary301@yahoo.com

* Correspondence: saadsmhassan@yahoo.com (S.S.M.H.); aamr@ksu.edu.sa (A.E.G.E.A.); ahkamel76@sci.asu.edu.eg (A.H.K.); Tel.: +201222162766 (S.S.M.H.);+966-565-148-750 (A.E.G.E.A.); +201000361328 (A.H.K.)

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Abstract: A simple, efficient and reliable analytical method was developed and used for the determination of the fluvoxamine drug (FLV) in pharmaceutical preparations and biological fluids. The method is based on the cost-effective screen-printed platform for the potential transduction of the drug. Host-tailored molecular imprinting polymer (MIP) was integrated with the potentiometric platform as a recognition receptor, in which FLV, acrylamide (AAm), ethylene glycol dimethacrylate (EGDMA) and acetonitrile were used as a template, functional monomer, cross-linker, and solvent, respectively. MIP particles were dispersed in plasticized poly (vinyl chloride) (PVC) and the membrane was drop-casted on carbon screen-printed electrode. The MIP, in addition to non-imprinted polymers (NIP), was characterized and the binding experiment revealed high affinity and adsorption capacity of MIP towards FLV. The proposed sensor displayed near-Nernstian cationic slope of 55.0 ± 0.8 mV/decade (r^2 = 0.999) with a low detection limit of 4.8 × 10^{-6} mol/L over a wide pH range (3.0–8.5). The electrochemical features of the proposed sensors including electrochemical impedance spectroscopy (EIS) and chronopotentiometry measurements (CP) in the presence of multi-walled carbon nanotubes (MWCNTs) as a solid contact transducer were also investigated. The applications of the proposed sensor for the determination of FLV in different dosage forms with recovery values (98.8%–101.9%) and (97.4%–101.1%), respectively compared with the reference HPLC method with acceptedFandt-student tests values at the 95% confidence level.

Keywords: molecular imprinting polymers (MIP); screen-printed; solid contact; ion-selective electrodes (ISEs); fluvoxamine; MWCNTs.

1. Introduction

Depression has a massive impact as a disability, which is a common and invalidating mental illness affecting approximately 2.5% of the general population as shown in the last guidelines update of the world health organization (WHO) in 2018 [1,2]. It harms a person's behavior and their social consequences in terms of reduced employment and psychosocial impairment. Postpartum

nanomaterials

MDPI

Article

Imprinted Polymeric Beads-Based Screen-Printed Potentiometric Platforms Modified with Multi-Walled Carbon Nanotubes (MWCNTs) for Selective Recognition of Fluoxetine

Saad S.M. Hassan [1,*], Ayman H. Kamel [1,*], Abd El-Galil E. Amr [2,3,*], Heba M. Hashem [1] and E.M. Abdel Bary [4]

1 Chemistry Department, Faculty of Science, Ain Shams University, Abbasia, Cairo 11566, Egypt; hebahashem426@yahoo.com
2 Pharmaceutical Chemistry Department, Drug Exploration & Development Chair (DEDC), College of Pharmacy, King Saud University, Riyadh 11451, Saudi Arabia
3 Applied Organic Chemistry Department, National Research Center, Dokki, Giza 12622, Egypt
4 Chemistry Department, Faculty of Science, Mansoura University, Mansoura 35516, Egypt; ebary301@yahoo.com
* Correspondence: saadsmhassan@sci.asu.edu.eg (S.S.M.H.); ahkamel76@sci.asu.edu.eg (A.H.K.); aamr@ksu.edu.sa (A.E.-G.E.A.); Tel.: +20-122-216-2766 (S.S.M.H.); +201-000-361-328 (A.H.K.); +966-565-148-750 (A.E.-G.E.A.)

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Abstract: Herein, we present a new validated potentiometric method for fluoxetine (FLX) drug monitoring. The method is based on the integration of molecular imprinting polymer (MIP) beads as sensory elements with modified screen-printed solid contact ion-selective electrodes (ISEs). A multi-walled carbon nanotube (MWCNT) was used as a nanomaterial for the ion-to-electron transduction process. The prepared MIP beads depend on the use of acrylamide (AAm) and ethylene glycol dimethacrylic acid (EGDMA) as a functional monomer and cross-linker, respectively. The sensor revealed a stable response with a Nernstian slope of 58.9 ± 0.2 mV/decade and a detection limit of 2.1×10^{-6} mol/L in 10 mmol/L acetate buffer of pH 4.5. The presented miniaturized sensors revealed good selectivity towards FLX over many organic and inorganic cations, as well as some additives encountered in the pharmaceutical preparations. Repeatability, reproducibility and stability have been studied to evaluate the analytical features of the presented sensors. These sensors were successfully applied for FLX assessment in different pharmaceutical formulations collected from the Egyptian local market. The obtained results agreed well with the acceptable recovery percentage and were better than those obtained by other previously reported routine methods.

Keywords: Solid-contact ISEs; multi-walled carbon nanotubes (MWCNTs); fluoxetine; screen-printed electrodes; method validation

1. Introduction

Fluoxetine (FLX) is one of the five drugs inserted under the selective serotonin re-uptake inhibitors (SSRIs) category that is used throughout the world as an anti-depressant drug. Depression diagnosis can be expressed as a mental health illness and disability. According to the world federation for mental health, depression is occurring as a reason for different problems that affect the behavior of humans. It can cause economic problems, increase the rate of unemployment and it is a main reason for family disturbance [1]. It can also cause occupational stress when the worker is facing work demands and is not matched with its requirements [2]. Fluoxetine hydrochloride was approved by the US Food and

DRUG DELIVERY SYSTEMS BETWEEN METAL, LIPOSOME, AND POLYMER-BASED NANOMEDICINE: A REVIEW

Saad S. M. Hassan,[a*] Ayman H. Kamel,[a*] Heba M. Hashem[a] and E. M. Abdel Bary[b]

Keywords: Drug delivery system; nano-medicine; metallic nano-material; polymeric nanomaterial, polymeric structures.

Herein, the drug delivery systems (DDS) based on nanomedicine proofed high potential and wide applicability that have distinct features related to Nano-sized. Enhancement of bioavailability and pharmacokinetics after oral administration via utility of natural/synthetic biodegradable polymeric nanomaterials. Improving biocompatibility, safety, enhanced permeability, better retention time, lower toxicity and efficient transportation of drugs to desired tissues or cells. These nanomaterials based on different types including metallic and polymeric Nano-medicine that can hydride with each other to gain new and unique features increase the efficiency of drug delivery and decrease patient compliance.

*Corresponding Authors
Fax: (+20)1222162766
E-Mail: saadsmhassan@sci.asu.edu.eg(S.S.M.H.); ahkamel76@sci.asu.edu.eg (A.H.K.)
[a] Chemistry Department, Faculty of Science, Ain Shams University, Cairo, Egypt
[b] Chemistry Department, Faculty of Science, Mansoura University, Mansoura, Egypt

INTRODUCTION

The therapeutic delivery in our bodies can be achieved by temporal and spatial drug delivery systems, which ensure effective and efficient transportation for the drugs into the desired cells and tissues.[1,2] Since 1500 BC, using the pills as a form of administration of drugs had the precedence.[3] Pill administration concept involves swallowing the pill and dissolving it in the stomach which is absorbed in the intestines and goes into circulation. Some limitations have been encountered in this approach, in cases of drugs which can break down in the stomach such as insulin. Consequently, insulin is injected into the fatty tissues and is then absorbed into the systemic circulation.[4] There are several other ways of drug administration such as transdermal, ocular and gastrointestinal or stimuli-reactive routes.[5] The first and second routes were applied, respectively, for avoiding the drawbacks of oral administration of pills. Later on, the sustained release was a desirable objective for developing the therapeutic profile by maintaining the drug levels in blood and tissues by a gradual release of medication for a prolonged interval of time, after single-dose administration.

The sustained-release phenomenon was achieved first in the late 1940s and early 1950s when the pills were coated with a talc-mucilage composition that converts the pills into shape looked alike pearls.[6] These coatings were hydrophobic and non-swelling at acidic pH of the stomach but are converted to ionized form in slightly alkaline pH of the intestinal region of the gastrointestinal tract, then get dissolved and release the drug. The prolonged time of drug release from the stomach to the small intestine, protect the stomach from the drug and protect the drug from being destroyed by digestive enzymes in the stomach.[7] However, these systems had some shortcomings due to their sensitivity for different physiological parameters such as pH, gastric emptying and so on.[8] The trials until the 1950s were unsuccessful to control drug release.

By progressing the drug release process, SmithKline Beecham developed the oral predetermined-release formulation as Spansules®.[9] Spansules® could sustain the release kinetics of dextroamphetamine sulfate (Dexedrine®) up to 12 h. Hence, the term of controlled release was achieved by developing the design of the tablets to prolong the time of therapeutic release through the introduction of different drug release mechanisms (dissolution-controlled, diffusion-controlled, osmosis-controlled, and ion-exchange-controlled mechanisms).

Introducing Spansules® as capsules containing micro-pellets coated with water-soluble wax, developed this design. Then the liposomes were considered as one of the earliest targeted systems, which were discovered in the 1960s. The anticancer agent was discovered as the liposomal-encapsulated formulation of doxorubicin (Doxil) in the 1990s which was approved first by the US Food and Drug Administration (FDA).[10]

The watershed in the drug delivery occurred in 1976 when Robert Langer and Judah Folkman discovered the large molecules could be delivered over days and weeks from polymer matrices.[3] The development was the replacement of waxy coatings with reproducible synthetic and more stable polymers that get gradually dissolved[7, 11] to insure the sustained level of effective drug concentration in the blood and enhance the control on drug release with obviously efficient new DDSs.[12,13]

DEVELOPMENT OF DDSs FROM BENCH-SIDE TO MARKET

Through the rigorous steps of the process of drug development from the laboratory bench to the pharmacies, we can understand the drug discovery and draw attention to

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