شبكة المعلومات الجامعية

التوثيق الإلكتروني والميكروفيلم

بسم الله الرحمن الرحيم

HANAA ALY

شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم

HANAA ALY

شبكة المعلومات الجامعية

التوثيق الإلكتروني والميكروفيلم

جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأقراص المدمجة قد أعدت دون أية تغيرات

يجب أن

تحفظ هذه الأقراص المدمجة بعيدا عن الغبار

HANAA ALY

Faculty of Women for Arts,
Science and Education
Ain Shams University

Synthesis and characterization of new hydrogels based on biopolymers for different applications

A Thesis Submitted for the Degree of Ph.D. in Organic Chemistry

By

Rana Abd El-Aziz Mosaad El-Zamly

(M.Sc. 2016)

To

Chemistry Department

Faculty of Women for Arts, Science and Education

Ain Shams University

Cairo, Egypt

Supervised by

Prof. Dr. Nadia G. Kandile
Professor of Applied Organic Chemistry
Faculty of Women
Ain Shams University

Prof. Dr. Howida T. Zaky
Professor of Organic Chemistry
Faculty of Women
Ain Shams University

Prof. Dr. Mansoura I. Mohamed
Professor of Organic Chemistry
Faculty of Women
Ain Shams University

Prof. Dr. David RK. Harding
Professor at Chemistry Institute
Massey University
New Zealand

Dr. Hemat M. Mohamed
Lecturer of Organic Chemistry
Faculty of Women
Ain Shams University

(2022)

Faculty of Women for Arts,
Science and Education
Ain Shams University

Approval Sheet

Synthesis and characterization of new hydrogels based on biopolymers for different applications

By

Rana Abd El-Aziz Mosaad El-zamly

Supervisor Committee:	*Thesis approved*
Prof. Dr. Nadia G. Kandile	……
Prof. Dr. Howida T. Zaky	…….
Prof. Dr. Mansoura I. Mohamed	……
Prof. Dr. David RK. Harding	……
Dr. Hemat M. Mohamed	……

Head of Chemistry Department

Prof. Dr. Omyma Ahmed Moustafa

(2022)

Faculty of Women for Arts,
Science and Education
Ain Shams University

Qualification

Name **: Rana Abd El-Aziz Mosaad El-Zamly**

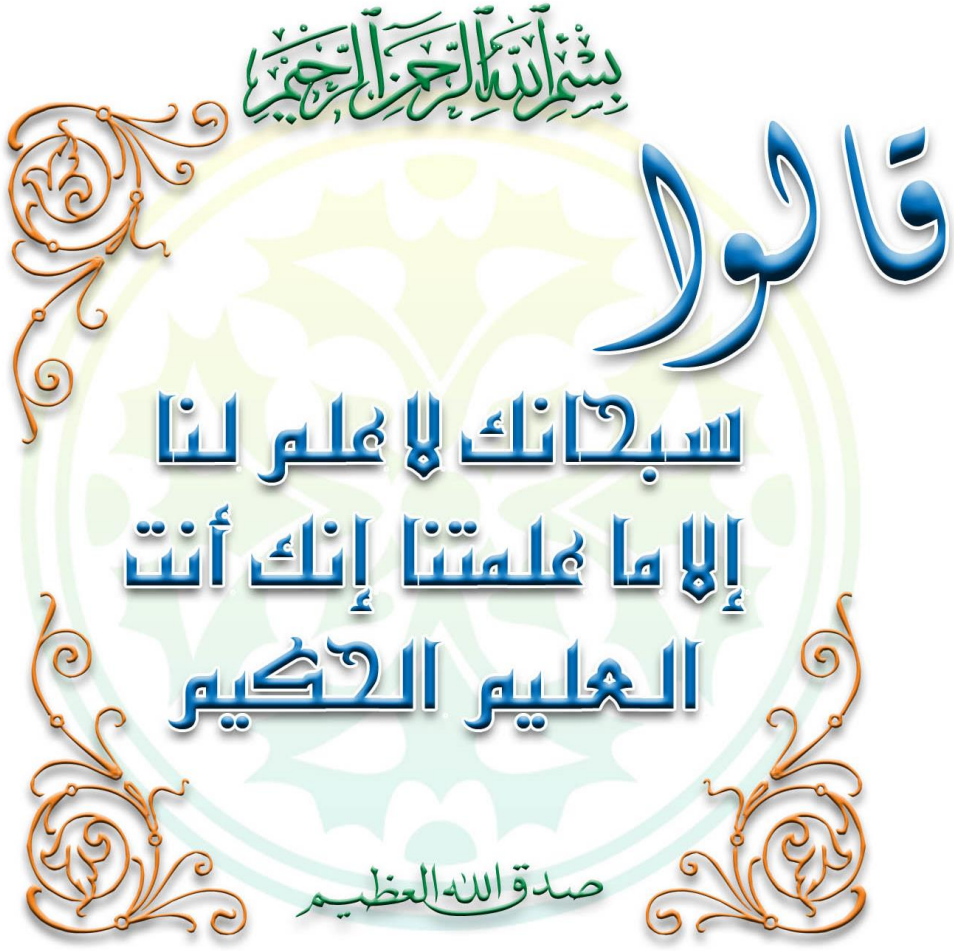
Scientific Degree **: Master Degree**

Department **: Chemistry**

Faculty**: Faculty of Women for Arts, Science and Education**

University **: Ain Shams University**

M. Sc. Date **: 2016**



سورة البقرة الآية: ٣٢

Acknowledgment

First and foremost, I feel always indebted to ***ALLAH,*** *the Most Kind and Most Merciful.*

I would like to express my deepest gratitude to:

- ***Prof. Dr. Nadia G. Kandile,*** *Professor of Applied Organic Chemistry at the Chemistry Department, Faculty of Women for Arts, Science and Education, Ain Shams University, not only for suggesting the subject investigated, but also for her continuous advice and valuable criticism during the course of this work.*
- ***Prof. Dr. Howida T. Zaky,*** *Professor of Organic Chemistry at the Chemistry Department, Faculty of Women, Ain Shams University, for her continuous guidance during all phases of the work.*
- ***Prof. Dr. Mansoura I. Mohamed,*** *Professor of Organic Chemistry at the Chemistry Department, Faculty of Women, Ain Shams University, for her continuous guidance during all phases of the work.*
- ***Prof. Dr. David RK. Harding,*** *Professor at Chemistry Institute, Massey University, New Zealand for her continuous guidance during all phases of the work.*
- ***Dr. Hemat M. Mohamed,*** *Lecturer of Organic Chemistry at the Chemistry Department, Faculty of Women, Ain Shams University, for her continuous guidance during all phases of the work.*
- *Thanks for every member in Chemistry Department,*

Dedication

To

My Parents and My Husband

I have to thank Allah for choosing

Them to be my family

Thank you for

Supporting and helping me

Thank you

Arabian Journal of Chemistry (2021) 14, 103255

King Saud University

Arabian Journal of Chemistry

www.ksu.edu.sa
www.sciencedirect.com

ORIGINAL ARTICLE

New sustainable chemically modified chitosan derivatives for different applications: Synthesis and characterization

Rana A. Elzamly [a], Hemat M. Mohamed [a], Mansoura I. Mohamed [a], Howida T. Zaky [a], David R.K. Harding [b], Nadia G. Kandile [a,*]

[a] *Chemistry Department, Faculty of Women for Art, Science and Education, Ain Shams University, Heliopolis Post Cod. No. 11757, Cairo, Egypt*
[b] *Chemistry, Institute of Fundamental Sciences, Massey University, Palmerston North, New Zealand*

Received 2 May 2021; accepted 3 June 2021
Available online 10 June 2021

KEYWORDS

Chitosan;
Terephthaloyl chloride;
Nanoparticles;
Congo Red;
Antimicrobial activity

Abstract The functionalization of chitosan (CS) by terephthaloyl chloride (TPC), glutaraldehyde (GA), and 4(4-(ethylcarbamoyl) benzoyl chloride) benzene sulfonamide was performed under different reaction conditions to yield the new hydrogels (I, II, III) respectively. However, hydrogel (I-NPs) was prepared from reaction of chitosan with (TPC) via ionic gelation technique using sodium tripolyphosphate (TPP) as a cross-linker. Moreover, hydrogel (I) was loaded (Au, Ag and ZnO) nanoparticles to give the nanoformulations (I-Au NPs, I-Ag NPs and I-ZnO NPs) respectively. Structural and morphological analysis of the new chitosan derivatives hydrogels and NPs formulations were characterized by FTIR, elemental analysis, TGA, DSC, XRD, SEM and TEM. From swelling study, chitosan derivatives hydrogels revealed higher swelling degree compared to (CS) with increasing time, temperature and pH values which reached maximum at pH 7 then decreased at pH 10. In addition, the maximum sorption capacities of Congo Red (CR) in aqueous solution were in the range 81–88%. Moreover, adsorption equilibrium isotherm results displayed favorable Langmuir model than Freundlich model. Furthermore, chitosan derivatives hydrogels showed broad spectrum antimicrobial activities against Gram-negative bacteria, Gram-positive bacteria and fungi with the inhibition zone diameter ranged from 13 to 25 mm compared to (CS) hydrogel which revealed inhibition zone diameter ranged from 11 to 16 mm, especially the nano formulation

* Corresponding author.
E-mail address: nadagh1@women.asu.edu.eg (N.G. Kandile).
Peer review under responsibility of King Saud University.

Production and hosting by Elsevier

https://doi.org/10.1016/j.arabjc.2021.103255

List of Contents