جامعة عين شمس
كلية العلوم
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استخدام بعض مشتقات الفيورانون لبناء أنظمة أخرى غير متجانسة الحلقات

رسالة مُقدمة من

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ماجستير العلوم فى الكيمياء 2013

للحصول على درجة دكتوراة الفلسفة فى العلوم
(الكيمياء العضوية)

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كلية العلوم
جامعة عين شمس

2017

جامعة عين شمس

كلية العلوم

قسم الكيمياء

رسالة دكتوراة الفلسفة فى العلوم فى الكيمياء العضوية

اسم الطالب : **سيد كرم رمضان إمام دحروج**

عنوان الرسالة : **استخدام بعض مشتقات الفيورانون لبناء أنظمة أخرى غير متجانسة الحلقات.**

اسم الدرجة : **دكتوراة الفلسفة فى العلوم فى الكيمياء**

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الدراسات العليا :

ختم الإجازة : أجيزت الرسالة بتاريخ / / 2017 م

موافقة مجلس الكلية موافقة مجلس الجامعة

/ /2017 م / / 2017 م

جامعة عين شمس
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الدرجة العلمية : دكتوراة الفلسفة فى العلوم

القسم التابع له : الكيمياء

اسم الكلية : العلوم

الجامعة : عين شمس

سنة التخرج : 2008

سنة الحصول على الماجستير : 2013

سنة المنح : 2017

كلية العلوم

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أتقدم بأسمى آيات الشكر والعرفان لله عز وجل ثم لأستاذى الفاضل:

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الذى أشرف على هذه الرسالة وبذل من جهده الكثير مما كان له أكبر الأثر فى إخراج هذه الرسالة إلى حيز النور.

وجزاه الله خيرا.

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شكر

بخالص الحب والإحترام أهدي هذه الرسالة لأسرتي الحبيبة ، ثم أتوجه بجزيل الشكر والعرفان لأساتذتي المشرفين على هذه الرسالة وهم:

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كما أتقدم بخالص التقدير والاحترام لكل أساتذتي وزملائي بقسم الكيمياء بكلية العلوم جامعة عين شمس.

سيد كرم رمضان

Ain Shams University
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Utilization of some furanone derivatives for the construction of other heterocyclic systems

A Thesis Submitted for the degree of Ph. D. of Science

(Organic Chemistry)

By

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M.Sc. in Chemistry, Faculty of Science
Ain Shams University, 2013

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2017

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Approval Sheet

Utilization of some furanone derivatives for the construction of other heterocyclic systems

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(M. Sc. 2013)

For Ph. D. Degree in Organic Chemistry

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2017

Dedication

To my parents

To my dear wife

To my lovely daughter;

Arij

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Acknowledgment

*First of all, thanks to **Allah** for helping me to accomplish this work.*

*I wish to express my great thanks to my supervisors Prof. Dr. **Ahmed Ismail Hashem**; Professor of Organic Chemistry, Faculty of Science, Ain Shams University; and Prof. Dr. **Wael S. I. Abou El-Magd**; Professor of Organic Chemistry, Faculty of Science, Ain Shams University; for their guidance, continuous interest, moral supports, encouragements and valuable criticism during the course of this work. It was really a great opportunity for me to study under their supervision that I could learn a lot of things on the organic synthesis.*

*Also, I give my thanks and regards to Dr. **Ahmed K. M. I. El-Ziaty**; Associate Professor of Organic Chemistry, Faculty of Science, Ain Shams University; for his generous supervision and continuous encouragement.*

Finally, I would like to express my appreciation to my wife, my family, my friends, my colleagues in the Chemistry Department and all people who helped me to finish this work.

Sayed Karam Ramadan

Abstract

Abstract

In this investigation, 2(3*H*)-furanone derivatives were utilized to construct a wide variety of heterocycles of synthetic and biological importance.

The original work of this thesis is presented in four parts:

Part I:

This part deals with the behavior of pyrazolyl-2(3*H*)-furanone towards some nitrogen nucleophiles. The acid hydrazide, obtained from ring opening of the furanone with hydrazine hydrate, was subjected to react with some electrophilic reagents. The antitumor activity evaluation of some of the synthesized compounds was investigated against three types of carcinoma cell lines: human liver carcinoma (***HePG2***), human colon carcinoma (***HCT116***) and human prostate cancer (***PC3***) cell lines.

Part II:

In this part, some 2(3*H*)-furanones bearing a chromonyl moiety were synthesized to study their behavior as alkylating agents. The intermolecular alkylation product was only obtained as sole product. The unfavored intramolecular alkylation mode is discussed.

Part III:

This part presents the chemoselectivity of chromonyl-2(3*H*)-furanone towards some nitrogen nucleophiles, as well as, thiation reaction. The antimicrobial activities of selected examples of the synthesized compounds were examined against two strains of bacteria and two fungus strains.

Part IV:

In this part, ring transformation of furyl-2(3*H*)-furanone to oxazinone and pyrimdinone derivatives is investigated *via* the reactions of acyl azide, obtained from this furanone, with some nitrogen nucleophiles, as well as, thermolysis in dry benzene and pyrolysis.

Keywords: 2(3*H*)-Furanone, Acid hydrazide, Acyl azide, Nitrogen nucleophiles, Intermolecular alkylation, Antitumor activity, Bacteria and Fungus strains.

Summary

Summary

Among heterocyclic compounds, 2(3*H*)-furanones represent an important type of five-membered heterocyclic systems. The importance of these compounds stems from the facile opening of the lactone ring with both nucleophilic and electrophilic reagents to give acyclic products. These acyclic products are the precursors of a wide variety of synthetically and biologically important heterocycles *viz.* pyrrolone, triazole, benzoxazinone, pyridazinone, thiazolidinone, quinolone and oxadiazole derivatives.

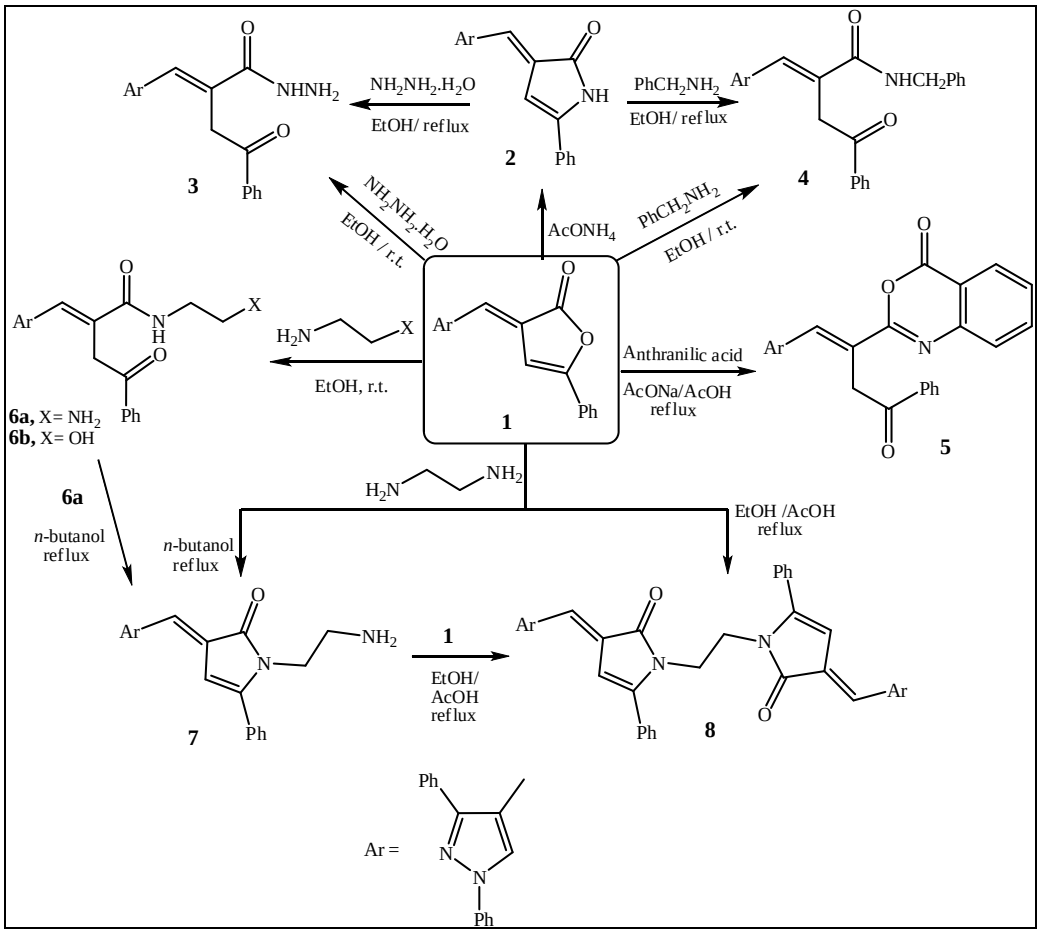
In this investigation, the author wishes to report on the behavior of 2(3*H*)-furanone derivatives towards some nucleophiles aiming to construct several heterocycles, to evaluate their biological activities e.g. antitumor & antimicrobial activities, and as alkylating agents.

The original work of this thesis consists of four parts:

Part I:

This part discusses the reactions of pyrazolyl-2(3*H*)-furanone **1** with different nitrogen nucleophiles e.g. ammonia, hydrazine hydrate, benzylamine and anthranilic acid to afford pyrrolone **2**, hydrazide **3**, *N*-benzylamide **4** and benzoxazinone **5** derivatives. The reaction of furanone with ethylenediamine and ethanolamine was found to be dependent on the reaction conditions. The acid hydrazide **3** was reacted with some electrophilic reagents e.g. 4-

chlorobenzaldehyde, chloroacetyl chloride, acetic anhydride and phenyl isothiocyanate to give Schiff base, oxadiazole, pyrrolone, pyridazinone and thiazolidinone derivatives. The chemical transformations in this part can be represented in the two **Schemes** (**A**) & (**B**).



Scheme (A)