Маха Альрахал

Магистрант кафедры химии - естественный факультет

Университет Альбаас

Хомс, Сирия.

Джумаа мерза

Проф, стоматологический факультет

AUST

Тал Картал, Хама, Сирия

Maha Alrahhal

MS student, Department of chemistry-faculty of science

Albaath University

Homs, Syria.

Joumaa Merza

Prof, faculty of dentistury

AUST

Tal Kartal, Hama, Syria

PREPARATION OF 4-METHYL-2-OXO-2H-CHROMEN-7-YL ACETATE FROM 7-HYDROXY-4-METHYL COUMARIN IN ALKALIN MEDIUM

Abstract: *In this research the compound 4-methyl-2-oxo-2H-chromen-7-yl acetate was prepared by the reaction between* 7-hydroxy-4-methyl coumarin *and acetic acid anhydride in alkalin medium at (110 °C) temperature reaction.*

The product was separated and verified using TLC and FT-IR.

Where the melting point (206 °C) and 90% yield.

Keywords: *Coumarin, Coumarin derivatives, 7-hydroxy Coumarin.*

ПОЛУЧЕНИЕ 4-МЕТИЛ-2-ОКСО-2Н-ХРОМЕН-7-ИЛАЦЕТАТА ИЗ 7-ГИДРОКСИ-4-МЕТИЛКУМАРИНА В ЩЕЛОЧНОЙ СРЕДЕ

Аннотация: *В данном исследовании соединение 4-метил-2-оксо-2Н-хромен-7-илацетат было получено реакцией между 7-гидрокси-4-метилкумарином и ангидридом уксусной кислоты в щелочной среде при (110 ° C). Ттемпературная реакция.*

Продукт разделяли и проверяли с помощью TCX и FT-IR.

Где точка плавления (206 ° C) и выход 90%.

Ключевые слова: *Кумарин, производные кумарина, 7-гидрокси кумарин.*

1. Introduction

Coumarins (2H-1-benzopyran-2-one) (1) consist of a large class of phenolic substances found in plants and are made of fused benzene and α-pyrone rings [1]. Coumarin exhibits anti-inflammatory property and is used in the treatment of oedema. This removes protein and oedema fluid from injured tissue by stimulating phagocytosis, enzyme production, and thus proteolysis [2]. Over the years, numerous derivatives of coumarins have been used as anticoagulant agents due to their resemblance to the structure of vitamin K. Moreover, coumarin analogues have been used as inhibitors of acetylcholinesterase Coumarin itself has a very low antibacterial activity, but compounds having long chain hydrocarbon substitutions such as ammoresinol and ostruthin show activity against a wide spectrum of Gram +ve bacteria such as Bacillus megaterium, luteus, Micrococcus lysodeikticus, and Staphylococcus aureus [3].

More recently, coumarin etheric derivatives have been synthesized because of their importance in synthesizing anti-Parkinson drugs that have a general structure [4].

The importance of hydroxy coumarin comes from the presence of biologically and industrially active sites in the structure.

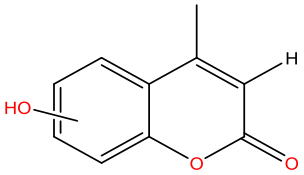
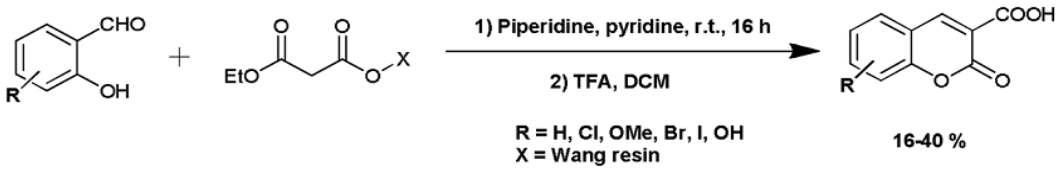


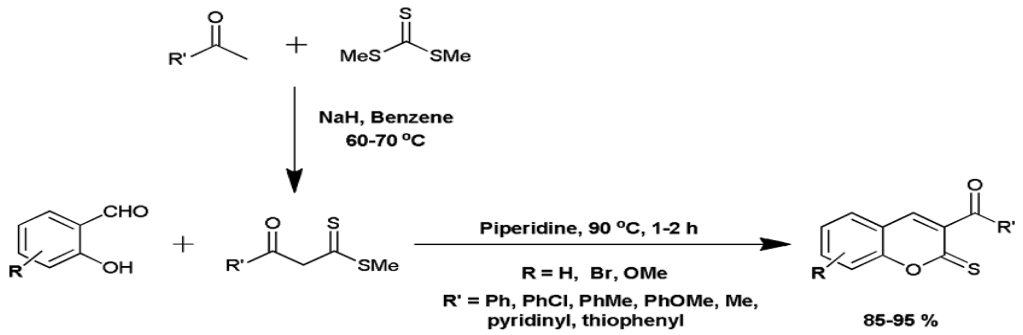
Figure 1: coumarin structure

Beckmann has studied an effective method for synthesizing coumarins involving the condensation of phenols or Maleic acid with-keto esters in the presence of an acid catalyst and in the presence of sulfuric acid and was this reaction is multifaceted as it is possible to react a wide range of phenolic derivatives Substituted with a broad group of-keto-esters derivatives in the presence of sulfuric acid and obtaining good radios of coumarins with substitutes for the benzene ring or the pteron ring [5]. This method is considered the simplest and most widely used in addition to the availability of starting materials it ensures the formation of coumarins with various substitutions in addition to the ease of reaction procedures and obtaining high yelds of coumarins manufactured in this way. Watson et al. discovered a solid-phase, mild and facile synthesis of substituted coumarin-3-carboxylic acid derivatives using the Knoevenagel condensation reaction between ethyl malonate bound to the Wang resin and ortho-hydroxybenzaldehydes in the presence of pyridine and piperidine at room temperature (Scheme 1) [6].



Scheme 1. Synthesis of coumarin-3-carboxylic acid.

Singh et al. have discovered a facile, efficient, and high-yielding synthesis of a 3-alkanoyl=aroyl=heteroaroyl-2H-chromene-2-thiones using b-oxodithioesters and various ortho-hydroxybenzaldehydes in the presence of piperidine under solvent-free conditions at 90 °C (Scheme 2) [7].



Scheme 2. Synthesis of 3-alkanoyl/aroyl/heteroarayl-2*H*-chromene-2-thiones.

This research aims to synthesize coumarin derivatives using a weak alkaline medium of potassium carbonate and using pyridine as a catalyst.

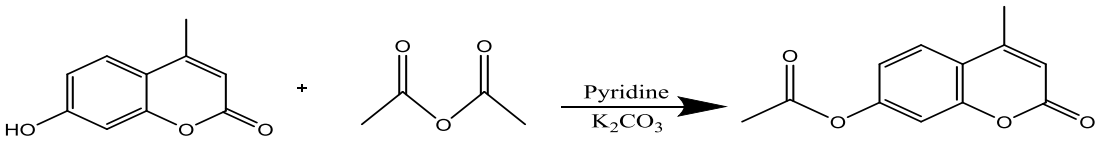
1. Experimental:

2.1. Instruments and materials:

Ethylacetoacetate, potassium carbonate, amberlest-15, and other used materials were high purity produced by Batch Company, FT-IR spectra was recorded using Jasco Infrared Spectrophotometer Fourier Transform FT-IR-4100 (KBr).

2.2. Preparation of 4-methyl-2-oxo-2H-chromen-7-yl acetate.

In a two-hole flask (0.23g, 1.30mmol) of 7-hydroxy-4-methyl coumarin, 15ml of pyridine and (6.5mmol, 0.8983gr) of potassium carbonate were added. Aafter two hours, acetic acid anhydride (0.123ml, 1.30mmol) was added at (110 °C), the reaction was monitored by thin layer chromatography (TLC) using (4: 6 hexane). The product was isolated using glass layer chromatography, with melting point (206 °C) and 90% yield.



7-hydroxy-4-methyl-2*H*-chromen-2-one + acetic anhydride → 4-methyl-2-oxo-2*H*-chromen-7-yl acetate

2. Results and Discussion:

3.1. Caracterization of 4-methyl-2-oxo-2H-chromen-7-yl acetate by FT-IR:

The infrared spectra for the present compounds taken in the range 400-4000 cm^{-1} helps to indicate regions of absorption vibrations. The main stretching peaks are for ν(C=C), ν(C=O) and ν(C-O). The IR data of the 4-methyl-2-oxo-2H-chromen-7-yl acetate and 7-hydroxy 4-methyl coumarin.

As it shown in figure (1) the hydroxy absorption band in the 7-hydroxy 4-methyl coumarin spectrum was eliminated in the product spectrum, wich indicate the reaction between the hydroxy groub and acetic anhydride.

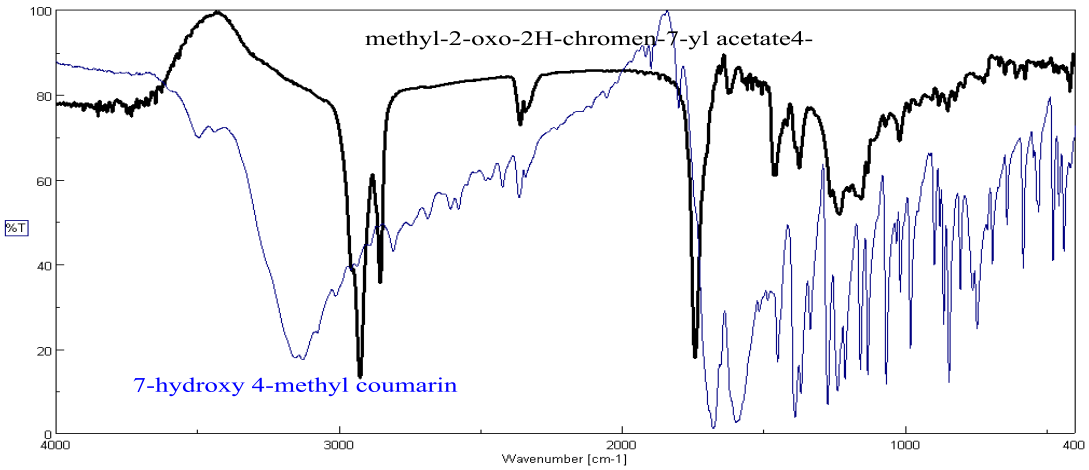
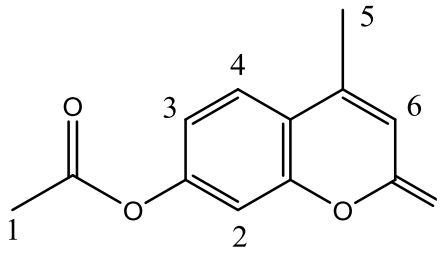


Figure 2: FT-IR spectrum of 4-methyl-2-oxo-2H-chromen-7-yl acetate and 7-hydroxy 4-methyl coumarin

3.2. Caracterization of 4-methyl-2-oxo-2H-chromen-7-yl acetate by H-NMR:

The following table shows the chemical shift values for the proton signals in the spectrum:

Table 1. Chemical shift of 1H-NMR (ppm) of the product



1H-NMR(δ,ppm)	No	1H-NMR(δ,ppm)	No
2.29 (S, 3H)	1	7.82 (d, 1H)	4
7.39 (S, 1H)	2	2.40 (s, 3H)	5
7.30 (d, 1H)	3	6.23 (d, 1H)	6

3. Conclusion:

In this study the compound 4-methyl-2-oxo-2H-chromen-7-yl acetate was prepared by the reaction between 7-hydroxy-4-methyl coumarin and acetic acid anhydride in alkalin medium with yield 90%.

References:

1. Y. Aoyama, T. Katayama, M. Yamamoto, H. Tanaka, and K. Kon, “A new antitumor antibiotic product, demethylchartreusin. Isolation and biological activities,” The Journal of Antibiotics, vol. 45, no. 6, pp. 875–878, 1992.
2. N. B. Piller, “A comparison of the effectiveness of some anti inflammatory drugs on thermal oedema,” British Journal of Experimental Pathology, vol. 56, no. 6, pp. 554–560, 1975.
3. K. Hodak, V. Jakesov ´ a, and V. Dad ´ ak, “On the antibiotic effects of natural coumarins. VI. The relation of structure to the antibacterial effects of some natural coumarins and the neutralization of such effects,” Cesko-Slovenska Farmacie, vol. 16, no. 2, pp. 86–91, 1967.
4. Stefanachi A, Leonetti F, Pisani L, Catto M, Carotti A. Coumarin: A natural, privileged and versatile scaffold for bioactive compounds. Molecules. 2018 Feb;23(2):250
5. J. Choi, K.T. Lee, H. Ka,W. T. Jung, H.J. Jung, and H. J. Park, Constituents of the essential oil of the Cinnamomum cassiastem bark and the biological properties, Archives of Pharmacal Research, 24,(2001), 418–423.
6. Watson BT, Christiansen GE. Solid phase synthesis of substituted coumarin-3-carboxylic acids via the Knoevenagel condensation. Tetrahedron letters. 1998 Aug 13;39(33):6087-90.
7. Singh OM, Devi NS, Thokchom DS, Sharma GJ. Novel 3-alkanoyl/aroyl/heteroaroyl-2H-chromene-2-thiones: Synthesis and evaluation of their antioxidant activities. European journal of medicinal chemistry. 2010 Jun 1;45(6):2250-7.