



## Physico-chemical properties of furan chalcone

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**ABSTRACT** Chalcones are open chain containing  $\alpha, \beta$  unsaturated ketones consisting of two aromatic rings having diverse of array of substituent. Substituted furan chalcone is synthesized by Claisen-Schmidt condensation method. Spectroscopic characterization using U-V visible, IR absorption and electrical conductivity, optical property and chemical tests has been investigated for substituted furan chalcone. Physico-chemical properties study of this compound shows that it is novel chalcone.

**KEYWORDS :** Furan chalcone, Claisen-Schmidt condensation method, Spectroscopy, physico-chemical property.

### 1. Introduction

Chalcone are abundant in edible plants and are considered to be the precursors of flavonoids and isoflavonoids. Isoflavonoids represent one of the largest groups of natural products [1-3]. Chalcones are open chain containing  $\alpha, \beta$ -unsaturated ketones consisting of two aromatic rings (ring A & B) having diverse any of substituent's [4]. Chalcone possess conjugated double bonds and a completely delocalized  $\pi$ -electron system on both aromatic rings [5]. All chalcones gives positive Wilson test dark red color with concentrated  $H_2SO_4$ , violet color with alcoholic  $FeCl_3$ [6]. In this paper we synthesize substituted furan chalcone by Claisen-Schmidt condensation method and characterize it by IR, UV spectra, Wilsons test,  $FeCl_3$  test, unsaturation test with  $KMnO_4$ , optical activity and conductivity. Chalcones which are also known as  $\alpha, \beta$ -unsaturated ketones is an important class of organic compounds [7] and reported to possess a wide spectrum of biological activities such as antibacterial [8], antifungal [9], anticancer [10], anti-inflammatory [11], antimicrobial, analgesic, antiplatelet [12], antiulcerative, antimalarial, antioxidant [13] and antitubercular activities. [14], some chalcones possess insecticidal activity and some of their derivatives are reported to be antimutagenic chalcones.

### 2. Experimental

Chalcones are synthesized by Claisen-Schmidt condensation of aldehyde and ketone by base or acid catalyzed followed by dehydration to yield chalcones [5]. The reagents used for preparation of furan chalcone are of A.R. grade. The mixture of 2,6, dihydroxy acetophenone (0.01 mol) and 5-methyl-Furaldehyde (0.01 mol) are dissolved in ethanol (20ml) and then sodium hydroxide 10ml(40%) were added to it. The mixture was stirred for 3 hours till brown color ppt was observed. The progress of reaction was monitored by TLC. After completion of reaction the contents were poured into ice water and then acidified by dil. HCL. The solid obtained was filtered and crude product was recrystallized from ethanol to give the chalcone. The reaction and mechanism for formation of furan chalcone is given in figure (1). The melting point of the substituted furan chalcone is determined by an open capillary tube and is unconfirmed. From thin layer chromatography the completion of reaction is observed. IR spectra are recorded using FT-IR spectrophotometer UV- visible spectrum of chalcone measured on SL159, single beam UV-VIS spectrophotometer. The purity of compound is checked by TLC plate, which were precoated with silica gel using solvent ethyl acetate and petroleum ether (3:7). The physico-chemical parameters are measured on colorimeter and conductometer.

### 3. Results and discussion

The substituted furan chalcone having IUPAC name 1-(2, 6-dihydroxyphenyl)-3-(5-methyl-Furan-2-yl) prop-2-en-1-one is stable at room temperature, insoluble in water and is soluble in ethanol. The stoichiometry of the compound may be represented as 1:1 substituted Furan and Acetophenone ratio. The physico-chemical properties of substituted furan chalcone are given in, table (1) and (2). The completion of reaction was checked by TLC, Wilsons test,  $FeCl_3$  test. The reaction and mechanism of formation of furan chalcone is represented in figure (1). From the reaction mechanism it is observed

that condensation of aldehyde group of furan and ketone group of acetophenone takes place in the presence of base catalyst.

#### 3.1 IR spectrum

The IR spectrum of  $\alpha, \beta$ -unsaturated carbonyl group has characteristic bands of chalcone at prominent bands between 1625 to 1650 per cm. The characteristic IR peaks give the presence of particular functional group. The region at which other absorption bands appear depends on the type of aromatic / hetero-aromatic rings as well as the substituent present on these rings. The characteristic bands for different groups in furan chalcone are (per cm),

3065-Ar-H, 1658-C=C, 1650-C=O, 1230-C-O-C, 3136(-OH), 3156(-OH)

#### 3.2 Electrical conductivity

The conductivity mechanism generally thought of being an intermolecular phenomenon. The electron donating or withdrawing properties of substituent on an aromatic system should affect the electrical conductivity and since availability of  $\pi$ -orbitals imported to the conductivity mechanism. The behavior of furan chalcone is shown in fig. (3).

#### 3.3 Optical activity

In the study of optical property, a plot between absorbance and concentration is expected to be a straight line passing through origin indicating the observance of Beer-Lambert's law, in substituted furan chalcone the plot is as shown in (fig.3). Increasing number of conjugated double bonds causes shift of the recorded absorbance spectrum to a larger wavelength as well as increase in its intensity. It is clear that each additional double bond in the conjugated

$$\sigma - \sigma > n - \sigma * \pi - \pi * > n - \pi *$$

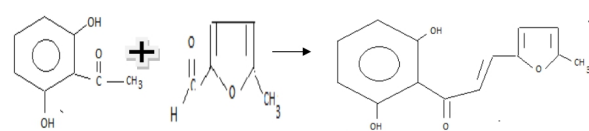
**Table (1): Physico-Chemical properties of furan chalcone**

Property	color	M.P.	yield	Chemical name	Chemical formula	Molecular weight	phase
Observation	brown	>2500c	80%	chalcone	$C_{14}H_{12}O_4$	244	Solid(Brown crystals)

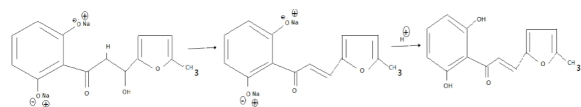
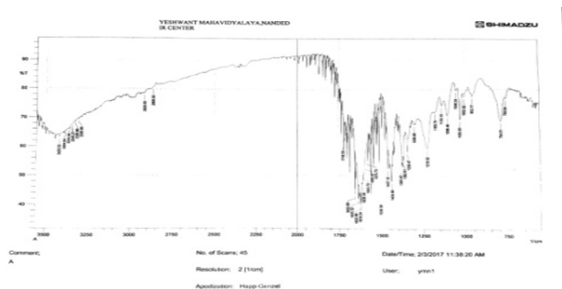
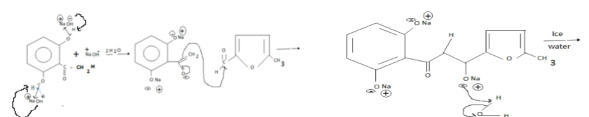
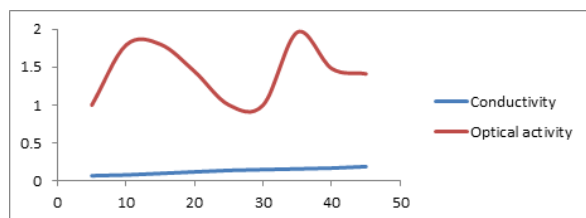
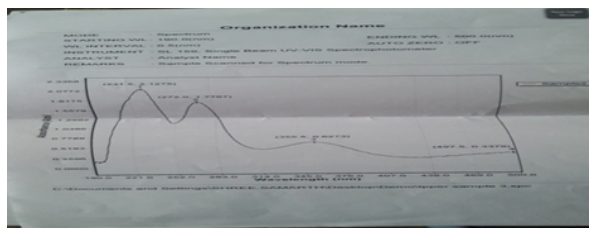
**Table (2): UV spectra.**

Absorption spectra	Wavelength
absorption	$\lambda$ (nm)
2.8346	248.0
2.9188	318.5
2.6441	414.0

**Figure (1): Reaction and Mechanism of formation of furan chalcone.**

**Reaction**2, 6, di-hydroxy 5-methyl-2-Furaldehyde  
Acetophenone

Chalcone

**Mechanism****Fig. (2): IR spectra for furan chalcone.****Fig.(3): Conductivity and optical activity of furan chalcone.****Fig.(4): U-V visible spectrum of furan chalcone.****4. Conclusion**

The substituted furan chalcone having IUPAC name 1-(2, 6-dihydroxyphenyl)-3-(5-methyl-furan-2-yl) prop-2-en-1-one has been synthesized by Claisen-Schmidt method and its structure is confirmed by I.R., U.V-visible, optical activity, Wilsons test, FeCl<sub>3</sub> test, and unsaturation test with KMnO<sub>4</sub>. This is novel substituted furan chalcone. The reaction mechanism for the formation of furan chalcone shows condensation of aldehyde group of furan and ketone group of acetophenone takes place.

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