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A New Type of Banana Shape Bifunctional Monomer of Ester Chalcones

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ABSTRACT

A synthesis of a new type of chalcone analogue banana-shaped liquid crystals compounds is described. The approach involved the reaction of hydroxyl chalcones with isophthaloyl dichloride to form benzene-1,3-dicarbonyl-bis-1-(4-alkoxyphenyl)-3-(4-hydroxyphenyl)prop-2-en-1-one (**7a-c** and **8a-c**) having two chalcone units *via* esterification reaction. The hydroxyl chalcones, which differ in the length of alkyl group, C_nH_{2n+1} , where $n=10, 12$ and 14 were synthesised *via* Claisen Schmidt condensation prior to the reaction with isophthaloyl dichloride. The reaction was a catalyst dependence. No sign of product was formed by employing NaH (60%). It was only occurred in the presence of NaH (95%) to afford banana shape bi-functional monomer of ester chalcone **7a-c** and **8a-c**. The synthesized compound was characterized by 1H and ^{13}C Nuclear Magnetic Resonance (NMR), and Fourier Transform Infrared (FTIR).

| Chalcones | banana shape liquid crystals | alkyl chains | ester |

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1. INTRODUCTION

Liquid crystal technology has been widely applied in device technology. Both fluidity and crystalline properties of liquid crystal facilitate better control over alignment when applied to device. The advantages of liquid crystals for these applications such as faster switching times, a wider viewing angle, continuous gray level, improved transmittance of the clear state, approximately no threshold voltage and low power consumption [1].

Series of linear shape of mesogens based on chalcone has been studied for their liquid crystal behavior [2,3]. Chalcone derivatives were reported for excellent nonlinear optic property [4] and liquid crystal displays [5,6]. Chalcones has been used in promoting light transmittance [7] and crystallability [8].

In recent years, banana-shaped liquid crystals have been given much attention in various aspects such as fast polarization reorientation, ferroelectricity and antiferroelectricity, and small threshold voltage when applied to liquid crystal display mode [9]. Banana-shaped liquid crystals have also been identified as interesting compounds due to their unexpected electro-optical properties, polarity and chirality [10].

In this paper, we describe the preparation of a new type banana shape compound of benzene-1,3-dicarbonyl-bis-1-(4-alkoxyphenyl)-3-(4-hydroxyphenyl)prop-2-en-1-one **5a-c** possessing alkyl chains of varying length from C_{10} to C_{14} which potentially used for liquid crystal studies.

2.0 EXPERIMENTAL

2.1 Materials and characterizations

4-hydroxybenzaldehyde, 4-hydroxyacetophenone, 1-bromoalkane, 4-hydroxychalcone and isophthaloyl dichloride were obtained from Merck Company and used as received. THF was dried over sodium and benzophenone. All other reagents and solvent were used as received. Infrared spectra were recorded on a Perkin Elmer 1605 Fourier Transform Infra-Red Spectrophotometer. 1H and ^{13}C NMR spectra were recorded using JEOL ECA 500 Spectrometer operating at 500 MHz for 1H and 125 MHz for ^{13}C with chemical shifts reported relative to $CDCl_3$ as standard reference.

2.2 Synthesis of 4-hydroxychalcones

Potassium hydroxide (KOH) (1.68 g, 30 mmol) in ethanol (90 mL, 95%) was stirred for 30 min. 4-hydroxyacetophenone (4.08 g, 30 mmol) and benzaldehyde (3.66 g, 30 mmol) were added to the solution mixture respectively. The reaction mixture was stirred at room temperature for 18 h. The mixture was cooled in an ice bath and acidified with hydrochloric acid (HCl) (12 M). The precipitate was filtered, washed and dried. Recrystallization was performed from hexane: ethanol (7:1) to afford compound **1** as light yellow solid, 2.02 g, 30 %, m.p. 175.0-177.0°C. ν_{max} (KBr / cm^{-1}) 3140 (-OH), 1646(C=O), 980(trans CH=CH) and 823(*para* disub benzene). δ_H (500 MHz, $CDCl_3$) 8.10 (d, J 8.6, 2H, H_{1-3}), 7.85 (d, J 15, 1H, H_{1-a}), 7.81-7.83 (m, 3H, $H_{1-3'}$ & $4'$), 7.75 (d, J 15, 1H, H_{1-b}), 7.43 (d, J 6.9, 2H, H_{1-2}), 6.96 (d, J 8.05, 2H, $H_{1-2'}$).

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