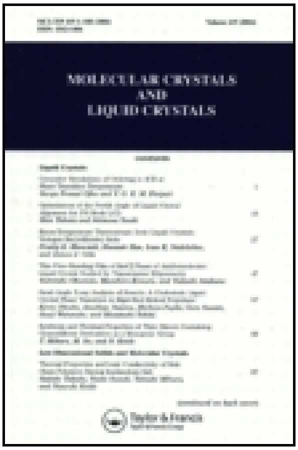

Molecular Crystals and Liquid Crystals Science and Technology. Section A. Molecular Crystals and Liquid Crystals

Publication details, including instructions for authors and subscription information:
http://www.tandfonline.com/loi/gmcl19

# Synthesis and Characterization of the Photo-Reactive Material for Photo-Alignment

Dong-Mee Song [a] & Dong-Myung Shin [a]

[a] Department of Chemical Engineering, Hong-ik University, 72-1, sangsu-Dong, Mapo-gu, Seoul, 121-791, Korea

Version of record first published: 24 Sep 2006

To cite this article: Dong-Mee Song & Dong-Myung Shin (1999): Synthesis and Characterization of the Photo-Reactive Material for Photo-Alignment, Molecular Crystals and Liquid Crystals Science and Technology. Section A. Molecular Crystals and Liquid Crystals, 327:1, 27-30

To link to this article: http://dx.doi.org/10.1080/10587259908026773

*Mol. Cryst. Liq. Cryst.*, 1999, Vol. 327, pp. 27-30
Reprints available directly from the publisher
Photocopying permitted by license only

Published by license under the
Gordon and Breach Science Publishers imprint.
Printed in Malaysia

# Synthesis and Characterization of the Photo-Reactive Material for Photo-Alignment

DONG-MEE SONG and DONG-MYUNG SHIN

*Department of Chemical Engineering, Hong-ik University, 72–1,sangsu-Dong,
Mapo-gu, Seoul 121–791, Korea*

*(Received June 30, 1998; In final form December 20, 1998)*

It has been known that the chalcone dimerizes efficiently. We modified BPDA-PDA (poly(surface with sulfuric acid and aqueous KOH solution. The modified surface provides the binding sites for photo-ractive materials. A chalcone derivative has been synthesized, which possesses reactive functional group to the modified surface. The synthesis of the chalcone derivative was confirmed. The photoreactions of the chalcone derivative were followed by UV-visible spectroscopy. The isomerization occurs with irradiation of UV light and finishes in 5 min. Succeedingly the photo-dimerization occurs.

*Keywords:* Chalcone derivative; Photo-dimerization

## INTRODUCTION

Stable, uniaxially aligned liquid-crystal-glass interfacing layers in liquid crystal displays (LCDs) are required for including the specific macroscopic molecular configuration. So far mechanically brushed, polymer coated substrates have aligned the long axes of adjacent liquid crystal molecules in brushing direction due to anisotropic surface interaction, but this rubbing method has some problems such as dust and difficulty in control the rubbing strength. Several photo-alignment techniques are introduced to solve the problems of conventional rubbing method. One of which is photo-dimerization of cinnamic acid derivatives attached as a side chain of polymers and we developed new technique that includes attaching photo-reactive material on polyimide surfaces. A chalcone derivative was synthesized as UV alignment material and was exposed to UV light for the photo-dimerization.

## EXPERIMENT

Photo-reactive materials were prepared by a three-step synthesis. To a stirred solution of 4-hydroxyactophenone in anhydrous DMF was added the sodium hydride at room temperature under nitrogen. The mixture was stirred at 25℃ for 30min, followed by the addition of iodopropane. After being stirred until the solution was to be colorless, the Compound 1(shown in FIGURE 1) was extracted with ethyl ether. Compound **2** was prepared under the similar experimental condition by using 4- hydroxybenzaldehyde. The synthesis of chalcone derivative was carried out by condensation of compound **1** and compound **2** in alkaline solution. The synthesized materials were confirmed with FT-IR spectroscopy

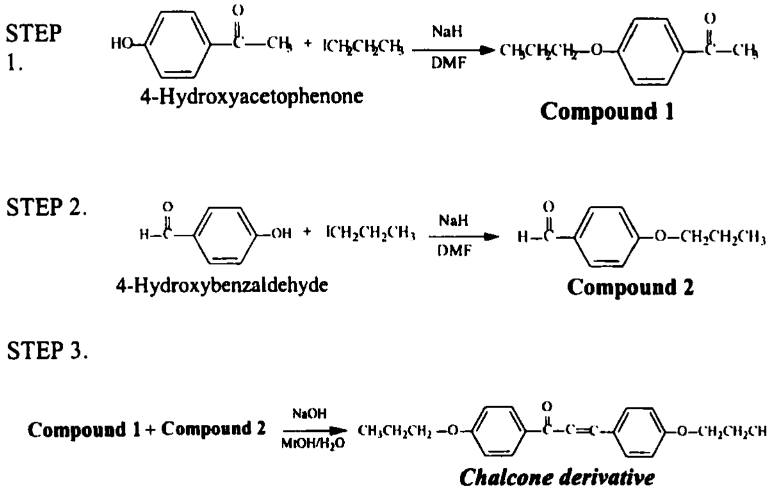

FIGURE 1. Synthesis of chalcone derivative.

(Nicolet magna IR 560). The solution of chalcone derivative was irradiated by 4W UV-lamp. The UV-absorption spectra were obtained as a function of the irradiation time with UV-visible spectrophotometer (HP8456).

## RESULTS AND CONCLUSIONS

The FT-IR spectra of compound 1 and compound 2(FIGURE 2) clearly show the introduction of alkyl chain to 4-hydroxyacetophenone and 4-hydroxybenzaldehyde. Both spectra have C-O-Ar stretching vibration peak at 1257 cm$^{-1}$and 1251cm$^{-1}$, respectively.

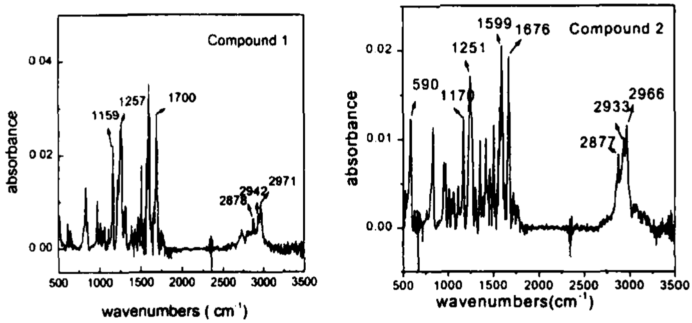

FIGURE 2. FT-IR spectrum of Compound 1 and Compound 2.

FIGURE 3 displays C=C stretching vibration peak near 1660 cm$^{-1}$. It means of successful condensation to the chalcone derivative. The UV spectrum of chalcone derivative before and after irradiation in the region 190nm-500nm

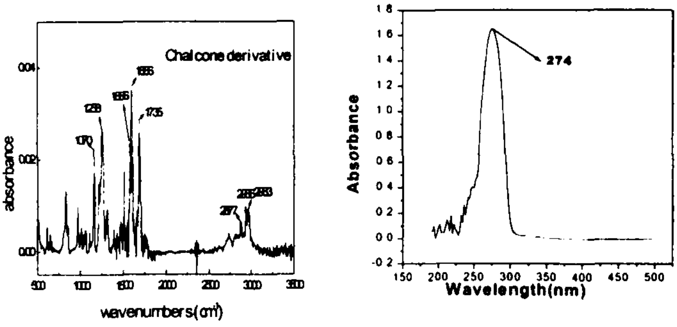

FIGURE 3. FT-IR and UV-Visible spectrum of chalcone derivative.

are shown in FIGURE 4 as a function of irradiation time (time interval-1min).

Distinct changes are observed in this region. The peak for the product before irradiation shows maximum value at 274nm, whereas the absorbance of the peak after irradiation decreases and the position is shifted at 262nm. The isobestic point of absorption spectra indicates that the cis-trans isomerization is the only process in solution for less than 5 min irradiation but the photo-dimerization occurs with more irradiation.

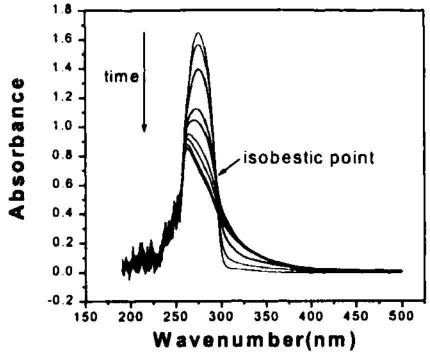

FIGURE 4. UV-visible spectrum of the solution of chalcone derivative.

Acknowledgements
This work was supported by KRF under grant No. 1997-001-D00271

## *References*

[1] M. Shadt,H. Seiberle, A. Schuster and Stephen M. Kelly, *Jpn. J. Appl. Phys.*, **34**(1995), 3240–3249.
[2] K.Y. Han, B.H. Chae, S.H. Yu, and J.K. Song, SID 97 Digest (1997),707.
[3] K. Ichimura, *Supramolecular Science*, **3**(1996), 67–82.
[4] M. Shadt, K. Schmitt, V. Kozinkov, and V. Chigrinov, *Jpn. J. Appl. Phys.*, **31**(1992), 2155.
[5] Morrison and Boyd, Organic Chemisty, 3rd ed, Allyn and Balcon, Boston, 1973.