Recent Developments in Photoalignment Technology: Alignment Properties of a Thiophene Based Bis-hydrazone Derivative

Gurumurthy Hegde*, Abhishek K Srivastava **, A.V.Adhikari*, K.Vishnumurthy***, M.M.Yusoff*, V.G.Chigrinov** and H.S.Kwok****

*Faculty of Industrial Sciences and Technology, Univ.Malaysia Pahang, Lebuhraya Tun Razak, Pahang Darul Makmur, 26300,Gambang, Kuantan, Malaysia
*murthyhegde@gmail.com
** Dept.of ECE, Hong Kong University of Science and Technology, Clear Water Bay, Hong Kong
*** Organic Chemistry Division, Dept.of Chemistry, National Institute of Technology, Karnataka, Surathkal, Mangalore, India

Keywords: thiophene, photoalignment, anchoring energy

ABSTRACT

Liquid crystal photoalignment on bis-hydrazones derived from thiophene derivatives is reviewed. Proposed material shows excellent alignment properties which is highly promisable for future applications. This photoalignment is based on reorientation phenomena attributed to thiophenes.

1. INTRODUCTION

In spite of their potential advantages, photoalignment technology is hammered due to lack of new material. There is still room for improvement and new materials are changing the way we are looking at the things. Lot of work has been devoted to light sensitive aligning materials (especially photo alignment) specially in flexible displays [1-3].

On the other hand, thiophene derivatives have been used extensively for synthesizing conducting materials which are chemically more stable than the other benzenoids [4]. Although lot of studies devoted to NLO (non linear optical) properties, but not much on their photoalignment behavior. Therefore, it has been thought that it will be worthwhile investigating photoalignment of nematic LCs by thin film made of bishydrazones derived from thiophene derivatives. Because of its reorienting nature with linear polarized light thiophenes are subject of interest in many applications. Here in this paper we are reporting new aligning material mainly bis-hydrazone derived from thiophene derivatives as a photoaligning layer.

2. EXPERIMENTAL

Figure 1 shows the chemical structure of the proposed bis-hydrazone derived from thiophene derivatives. Figure 2 shows the UV/vis absorption spectrum of bis-hydrazone derived from thiophene derivatives of wavelength 340nm.

To prepare alignment films, bis-hydrazone derived from thiophene was dissolved in NMP (1-methyl-2-pyrrolidone) solution with fixed concentration of 1% by weight. The solution was spin coated at 800 rpm for 10 seconds and 2000 rpm for 30 seconds onto substrates preliminary treated for 20 minutes with the ozone plasma in UVO-cleaning machine.

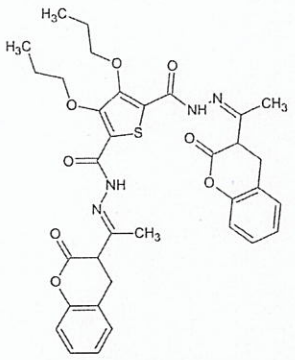

Fig 1: Chemical structure of thiophene based bis-hydrazone derivative.

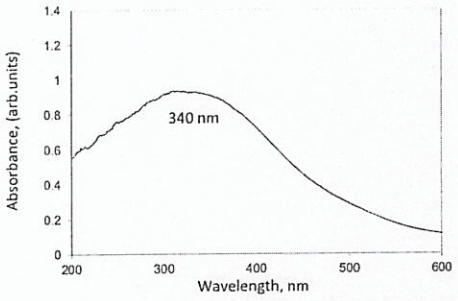

Fig 2: UV/vis absorption spectra of thiophene based bis-hydrazone derivative. Absorption peak is around 340 nm.

Subsequently films were dried at 100 °C for 5 minutes and 130 °C for 20 minutes. After this step films were irradiated with linearly polarized UV light from the high pressure mercury lamp. The light intensity on the film position was found to be 3 mW/cm^2. The parallel and TN cells were prepared and filled with liquid crystals