

**Sym. I : Polymers for Electronics**

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**D-TUE-14****EFFECT OF POLYMER GLASS TRANSITION TEMPERATURE ON ELECTRO-OPTIC RESPONSE OF LIQUID CRYSTAL/POLYMER COMPOSITE FILMS**

YOUNG CHUL KIM, C. J. KIM, C. Y. KIM (Polymer Materials Lab, KIST, Seoul 130-650, Korea), J. W. LEE and J.-I. JIN (Dept. of Chem., Korea Univ., Seoul 136-701, Korea)

Electro-optic response characteristics of UV-cured 11  $\mu$ m-thick E63/[Poly (bisphenol A ethoxylate diacrylate)](80:20 by wt.) composite films have been investigated as a function of temperature. Glass transition temperatures ( $T_g$ ) of the polymers with the (ethylene oxide)/phenol ratio (EO/Ph) of 1, 2, and 4 were measured to be 54, 42, and -6  $^{\circ}$ C, respectively. This change in  $T_g$  strongly influenced the electro-optic response of the composite films. When a 1 kHz, 85 V<sub>rms</sub> AC field with a duty cycle of 100 msec-on and 300 msec-off was applied to the film being heated, the turn-on response time ( $t_{on}$ ) gradually decreased with increasing temperature. The turn-off response time ( $t_{off}$ ), however, initially increased to show the maximum and then decreased. Moreover the maximum  $t_{off}$  was always observed at a temperature in the vicinity of  $T_g$  of the polymer matrix. For the composite film with EO/Ph=2,  $t_{off}$  was 55 msec at room temperature but increased to 146 msec at 46  $^{\circ}$ C, and then decreased again to 63 msec at 67  $^{\circ}$ C. As EO/Ph increased from 1 to 4,  $t_{on}$  at room temperature decreased from 11 to 6 msec while  $t_{off}$  increased from 35 to 69 msec. This implies that the interfacial interaction between the liquid crystal and the polymer decreased with increasing EO/Ph.

**Sym. I : Polymers for Electronics**

CONDUCTING POLYMER

**D-TUE-15****ON THE MECHANISM OF CURRENT-PRODUCING PROCESSES IN THE POLYANILINE-TYPE CONDUCTING POLYMERS, V.Z. BARSUKOV, S.V. CHIVIKOV, V.G. KHOMENKO (Dept. of Chemistry, SALIU, 2, N-Danchenko str., Kiev 252011, Ukraine. E-mail: chemi@mail.kar.net)**

The paper contains results of experimental and theoretical investigation of the mechanism for current-producing process in polyaniline (PAN)-type conducting polymers.

The "capacitor" conception of a current-producing process in conducting polymers of a polyaniline type has been considered. According to this conception, a charge-discharge process of the PAN in absence of external oxidizers-reductions takes place in the way of charging-discharging the effective capacity of double electric layer, which is abnormally high in the systems under consideration (400...800 F/g) due to formation of a double electric layer at a molecular level.

Micro- and macroscopic models of the electrodes which would allow one to explain the experimental data observed were proposed. These models take into consideration the peculiarities of PAN molecular structure and the unusual electrical conductivity of PAN.

Sequential development of the "capacitor" concept will make it possible to explain the peculiarities of the electrochemical behavior of PAN.

**Sym. I : Polymers for Electronics**

CONDUCTING POLYMER

**D-TUE-16****PREPARATION AND CHARACTERIZATION OF HIGHLY EFFECTIVE ELECTRODE MATERIAL FOR POLYMER BATTERY, MYONG-HOON LEE, and SUNG S. KIM (Dept. of Polymer Sci. & Tech, Chonbuk Nat. Univ., Chonju, Chonbuk 561-756 Korea)**

Conducting polymers have been studied extensively as a candidate for an electrode material of the rechargeable batteries due to its advantages such as high energy density and good processibility. In this presentation, a new preparation method of polypyrrole molecularly composited with electroactive ferrocenic dopant is discussed as well as its electrochemical characteristics. New ferrocenic alkyl sulfonate was synthesized from the sodium ferrocenyl methoxide and butanesultone and used as a dopant for the polypyrrole during the electro-polymerization of pyrrole. Increase of electrochemical activity was observed for this conductive polymer composite, which is desirable property for the electrode material of plastic batteries.

**Sym. J : Energy Conversion & Storage Materials**ENERGY CONVERSION & STORAGE MATERIALS-I  
**E-TUE-01**

LAYER-STRUCTURED HOMOLOGOUS OXIDES OF ZnO-In<sub>2</sub>O<sub>3</sub> FOR THERMOELECTRIC ENERGY CONVERSION, K. KOUMOTO, W. S. SEO, M. OHTA, M. KAZEOKA (Dept. of Appl. Chem., Nagoya Univ., Nagoya 464-8603, Japan)

We have proposed that homologous series in the ZnO - In<sub>2</sub>O<sub>3</sub> system with layer structures can be candidate materials for thermoelectric conversion due to their low thermal conductivity and comparatively high electron mobility. Crystal structures can be easily modified by substitution of either divalent or trivalent cations for Zn or In ions, respectively. Substitution of cations which are smaller than Zn or larger than In in ionic size gives rise to the shrinkage of c-axis and the elongation of a-axis of a hexagonal unit cell. An optimum amount of substitution increases electron mobility and hence the figure of merit, Z, coupled with lowered thermal conductivity, which is possibly caused by suitable modification of the electronic structure associated with distortion of the crystal structure. For instance, substitution of 5 mol% Y for In or 1 mol% Co for Zn realized about one order of magnitude increase in Z up to 1.0 ~ 1.3  $\times 10^{-4}$  K<sup>-1</sup> at 1200 K. On the other hand, substitution of small trivalent ions for In ions, such as Al, Fe, and Ga ions, all deteriorated the properties.