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SYNTHESIS AND PROPERTIES OF POLYIMIDE-BASED SECOND-ORDER NONLINEAR OPTICAL MATERIAL, T.-D. KIM and K.-S. LEE (Dept. of Macromolecular Science, Hannam Univ., Taejon, 300-791, Korea)

Recently, polyimides having NLO chromophore have been extensively investigated for photonics device applications because of their high glass transition which is very effective in stablizing the dipole orientation of the NLO chromophore even at elevated temperatures.[1] In this study, we synthesized NLO polyimide (PI-SOT) by Mitsunobu reaction of diol chromophore with diimide, which can avoid the thermal imidization process at high temperature.[2] From DSC and TGA thermograms, PI-SOT showed a glass temperature at ca. 186℃ and an initial decomposition temperature at ca. 200℃. PI-SOT was easily processed into high optical quality films and its optical nonlinearity was measured by SHG method under *in-situ* poling condition. It showed a high second-order optical nonlinearity (d_{33} = 24.6 pm/V) and a good thermal stability of oriented dipoles up to 150℃.

(1) K.-S. Lee, K.-Y. Choi, J. C. Won, B. K. Park, and I.-T. Lee, *US Patent 5,212,277*, May 18, 1993. (2) K.-S. Lee, K.-J. Moon, H. Y. Woo, and H.-K. Shim, *Adv. Mater.*, in press 1997.

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SYNTHESIS OF NONLINEAR OPTICAL POLY(ETHER IMIDES) AND THEIR CHARACTERIZATION FOR ELECTROOPTICAL DEVICES, H. J. LEE, M. H. LEE, J. -H. AHN, M. -C. OH, S. G. HAN, and H. G. KIM (Photonic Switching Section, ETRI, 161 Kajong-Dong, Yusong-Gu, Taejon 305-600, Korea)

Electrooptic poly(ether imides) with high thermal stability have been synthesized by direct coupling of precursor hydroxy poly(ether imides) and NLO chromophores. Various well-known chromophores such as DR1, tricyanovinylino aniline and newly designed chromophores were used in this polymer system. The resulting amorphous EO poly(ether imides) exhibited good solubility in common organic solvents, provided optical-quality thin films by spin coating. The glass transition temperatures and the electrooptic coefficients (r33, @1.3mm) of the polymers are in the range of 170 to 210 oC and 9 to 15 pm/V by electrical poling at 100 V/mm, respectively. Poling induced birefringences of the poly(ether imides) with various chromophores were studied for the optical device. The detailed polymer synthesis, characterization and optical performances are presented.

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CHARACTERRISTICS AND SYNTHESYS OF SOLUBLE POLYPYRROLE, YONG WAN HWANG, BUM SUK KIM*, MIN-KYU SONG, SE YOUNG OH, JINHWAN KIM**, KOOKHEON CHAR*** AND HEE-WOO RHEE (Dept. of Chem. Eng., Sogang Univ., Seoul 121-742, Korea, *Hyosung Living Industry CO., LTD., Anyang, Kyunggi 431-080, Korea, **Dept. of Sci. and Eng., SungKyunKwan Univ., Suwon, Kyunggi 442-746, Korea, ***Dept. of Chem. Eng., Seoul National Univ., Seoul 151-742, Korea)

PPy soluble in organic solvents was chemically synthesized with DBSA as a dopant and APS as a oxidant. PPy synthesized at monomer - to - oxidant ratio of higher than 5 was highly soluble in organic solvents such as *m*-cresol and chloroform. PPy film had electrical conductivity of above 20 S/cm. Different solubilities of the PPy powders may be related to conjugation length of PPy, indirectly confirmed by FT-IR spectra. XRD peak at small-angle suggested 'layered structure' of PPy film.

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The Investigation of Syntheses and Thermal Properties of Photosensitive Polyimides, Lee Dae Woo, Lee Sang Jin, Kim Mi Ra, Heo No Sung, and Lee Jin Kook(Dept. of Polym. Sci. & Eng., Pusan Nat'l Univ., Pusan 609-735, Korea).

Polyimide(PI)s have been widely used as insulation materials for microelectronic devices because of their excellent properties, such as thermal and chemical stability, and low dielectric constant. However, the aromatic PI is usually intractable because of its insolubility to organic solvent and high melting temperature. Therefore, the most widespread route for the preparation of aromatic PI is the two stage; polyaddition and polycondensation of dianhydride with a diamine in aprotic solvents, such as N,N-dimethyl acetamide (DMAc) and N-methyl-2-pyrrolidinone (NMP). A soluble polyamic acid is obtained as the imide prepolymer in the first stage; then cyclodehydration of this intermediate polymer, either by heat or chemical resgents, yields the PI. A polyimide that is photosensitive has been synthesized from the maleic anhydride photodimer and diamine derivatives. Tricyclo[4.2.2.0]dec-9-ene-exo,endo-3,4:7,8-tetra-carboxylic dianhydride(TCDDA) was synthesized and used for polycondensation with aromatic diamine in order to obtain the polyimides. These products were analyzed by FT-IR, ^{1}H-NMR, and ^{13}C-NMR. It was analyzed that an imidization process occurred during heating from polyamic acid to polyimide by FT-IR and TGA.

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