Abstracts

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R-10-PO14

Synthesis and Characteristics of Poly (3-Hexylthiophenes) (P3HT) Nanowire

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The poly (3-hexylthiophene) (P3HT) nanowires were electrochemically synthesized in the nanoporous membrane. The solution used for the electrochemical polymerization was consisted of 3-hexylthiophene monomers, 1-buthyl-3-methylimidazolium hexafluoro-phosphate ($BMIMPF_6$) as a dopant, and acetonitrile (CH_3CN) as a solvent. After the polymerization of P3HT nanowires in the nanopores of the membrane, the P3HT nanowires were obtained by the removal of membrane by using either HF or NaOH solution. The nanowires were visualized through a scanning electron microscope (SEM) and transmission electron microscope (TEM). The diameter and length of nanowires was about 200 nm and 25 $\sim$ 38 μm. The Raman and Fourier transform infrared (FTIR) spectroscopy were performed to confirm the electrochemical polymerization of the P3HT nanowires. The UV-Vis and PL spectra of the dispersion of P3HT nanowires in chloroform solution showed the $\pi - \pi^*$ transition, bipolaron state, and PL peaks. The PL spectrum of the single strand of P3HT nanowire was obtained through the laser confocal microscope photoluminescence experiments.

R-10-PO15

Organic Light Emitting Diode based on Light Emitting Polymer Nanotubes

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Organic light emitting diodes (OLEDs) were fabricated by using nanocomposites of polymer blend. Nanocomposites were used as light emitting layer (EML). Nanocomposites were consisted of light emitting polythiophene (PTh) or poly (3-methylthiophene) (P3MT) nanowires as a light emitting active layer and poly (9-vinylcarbazole) (PVK) as a matrix polymer layer. Poly (3,4-ethylenedioxythiophene) as a hole transport layer was coated by using solution-casting method on indium tin oxide (ITO). The tris (8-hydroxyquinoline) aluminum (Alq_3) as an electron transport layer was deposited on EML using organic molecular beam deposition method. The light emitting polymer nanotubes in the nanoporous of alumina template (Al_2O_3) were synthesized through electrochemical polymerization. The electrolyte was consisted of monomer, dopant, and solvent. Solvent was acetonitrile (CH_3CN) and tetrabutylammonium hexafluorophosphate ($TBAPF_6$) was used as dopant. We measured optical and electrical properties of the OLEDs based on light emitting polymer nanotubes. We discuss the control of the light emission character (i.e., electroluminescence efficiency and brightness) through the change of properties in light emitting polymer nanotubes.

R-10-PO16

π-Conjugated Polymer Nanotubes and Nanowires Synthesized by using Ionic Liquid

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Nanotubes and nanowires of π-conjugated polymer such as polypyrrole (PPy), polythiophene (PTh), and poly (3-methylthiophene) (P3MT) were synthesized by using nanoporous anodic aluminum oxide (Al_2O_3) template through electrochemical polymerization method. For the polymerization as the forms of nanotubes and nanowires, we used an ionic liquid, 1-butyl-3-methylimidazolium hexafluorophosphate ($BMIMPF_6$), as a dopant. To confirm the formation and structural properties of the polymer nanotubes and nanowires, the experiments of scanning electron microscope (SEM), transmission electron microscope (TEM), Fourier transform infrared (FT-IR) spectra, and ultra-violet and visible (UV/Vis) absorbance were performed. The doping level of the polymer nanomaterials was controlled by using cyclic voltammetry based on solution of catalyst in the ionic liquids. We observed that the polymer nanomaterials have different doping states through the repeated reduction cyclic. Through laser confocal microscope experiments, we investigated optical properties for a single strand of polymer nanotubes and nanowires.

R-10-PO17

Fabrication and Characterization of Polyaniline-Polyvinyl Acetate Composite Film

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Polyaniline is a conducting polymer which is capable of exhibiting a significant electrical conductivity. However, few applications have been reported because conducting polymers base on polyaniline exhibit poor physical and mechanical properties and are not soluble in common solvent. To overcome these drawbacks, researches have been generated to produce composites of conducting polymer and some insulating polymers. In this study, chemically synthesized Polyaniline (PAni) doped with perchloric acid (H_2ClO_4) was mixed with Polyvinyl Acetate (PVA) in different concentration. It was formed into films and made with uniform thickness using a calendering machine. Mechanical properties and electrical conductivities of different concentration of PAni-PVA composite films were measured and compared. The result of the mechanical test of the prepared composite films revealed a higher plastic property due to the presence of PVA. The conductivity of the prepared composite films was found to increase with an increase of the PAni concentration. Structural characterization was also done in the composite films using the Fourier Transform Infrared Spectroscopy. It was found that the 50 % preparation ratio gives the best quality of composite films in terms of its mechanical property and electrical conductivity.

R-10-PO18

The Partial Discharge Characteristics of the Ultra-High Voltage Cable Insulators According to the Tilt of Needle Electrode

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In this paper, we investigated the effect of the cross linked polyethylene (XLPE) insulator according to the tilt of needle electrode into XLPE which is used as the insulation of the electric power cable for the ultra-high voltage. In order to investigate the effect of changing tree phenomenon according to the tilt of needle electrode on the electrical conduction mechanism, a partial discharge experiment was conducted according to the voltage at room temperature from 1 kV to 40 kV applied to the electrode. The electrical field distribution according to the tip of needle electrodes is examined using ELECTRO as a Quasi-static electrical field analysis program.

As a result of experiments, we found that the specimen with tilt 20° has highest electric field and the specimen with air void has higher partial discharge current properties than the specimen with no void. The partial discharge properties of simulation of using ELECTRO are stable at tilt 45° and the result with properties with a partial discharge experiment is similar. The effect of the inner discharge becomes large when the air void specimen is bigger than no void specimen. The specimen reduced breakdown field at 20° needle electrode.