CHAPTER VII
CONCLUSIONS AND RECOMMENDATIONS

Since conductive polymers are potential materials which can be applied in various applications, they have been widely studied for decades. Most previous studies of these polymers have been based on the properties either the solutions or the films. Therefore, this research work was focused on the properties of conductive polymers both in their solutions and nanofibers produced by electrospinning. The conductive polymers which were selected to study in this work are a poly(p-phenylene vinylene) (PPV) based polymer (i.e., poly(2-methoxy-5-(2'-ethylhexyloxy)-1,4-phenylenevinylene) (MEH-PPV)), a poly(p-phenylene ethynylene) (PPE) based polymer (i.e., poly(ethylhexyloxy-octyloxy-p-phenylene ethylene) (EHO-OPPE)), and a poly(fluorene) based polymer (i.e., poly(2,7-(9,9-bis(2-ethylhexyl)fluorene)) (BEH-PF)).

Based on all results, a versatile method for tuning the optical properties of MEH-PPV was accomplished by the reaction of the polymer with pyridinium formate (PF), a volatile organic salt. The variation in the optical properties arises from the breaking of some double bonds along the conjugated chains and the removal of MEH side groups. The extent of these structural changes dictates the optical properties of the modified MEH-PPV. The results obtained in this work signify the ability to systematically tuning the optical properties of MEH-PPV. Moreover, it should be possible to tune optical properties of other conductive polymers by the reaction of the polymer with PF. The polymers should have some reactive sites (e.g., double bonds, triple bonds) along the conjugated chain and/or some side groups which would be easily reacted with PF. If it is effective, presumably, the structural change could be occurred in the original polymer resulting in the changed distributions of HOMO-LUMO energy gap of chromophores. These directly reflect the optical properties of a modified polymer as a red or blue shift could be found in absorption and photoluminescence (PL) spectra. This would lead to utilize potentially for a wide range of applications such as OLED and solar cells which require the full range color and various types of HOMO-LUMO energy gap.

In addition, the incorporation of polymer molecules in blends of conductive polymer and polymer matrix in a solid state either in films or fibers is another important parameter which significantly affects the optical properties of the polymers. Various types of molecular interaction between polymer molecules caused by kinetically-trapping, molecularly-mixing, and thermodynamic miscibility, etc., could lead to aggregated or dispersed conductive polymer molecule phases. Moreover, annealing at high temperature above the glass transition temperature of conductive polymer, polymer matrix, or blend could be used to control the optical properties of blends as the red or blue shift would be found depending on what types of blends or molecular interactions.

The recommendation of the future work will be based on the tuning optical properties of other conductive polymers by the reaction of the polymer with PF. Moreover, applications of the light emitting electrospun fibers in sensor applications such as chemical and thermal sensors are interesting. Full color light emitting electrospun fibers from other conductive polymers with another inert polymer matrix should be investigated in order to apply in OLED and flat panel display applications.