

CHAPTER IV

CONCLUSION

Poly(3-hexylthiophene) (P3HT) has been successfully prepared by polymerization of 3-hexylthiophene with anhydrous ferric chloride. The optimum condition to obtain the highest %yield and head-to-tail (%HT) was found when the polymerization was performed at room temperature in dichloromethane at mole ratio of 3-hexylthiophene to anhydrous ferric chloride equals 1:3. The lower temperature and mole ratios of starting materials than the optimum condition gave incomplete reactions. On the other hand, raising the temperature and mole ratios than the optimum condition led to degradation and short polymer chain. No significant relation of the solvent effect to the outcome of polymerization was observed. The presence of additives including water or acids tended to lower yield and quality of the resulting polymer. Anhydrous ferric chloride without any additives was still the best reagent for the synthesis of P3HT.

Doping P3HT with protonic acid was made possible using TCA with no pre-precipitation problem. Stronger acid doping, however, needed the solvato-controlled condition, in which MSA and thiophene were found to be the optimized pair of strong dopants and good coordinating base. The optimum condition in the study showed homogeneity throughout the whole process of turning the solution into film.

The doping of P3HT solution with Lewis acids resulted in the higher absorbance at higher wavelength, but some of doped polymer was precipitated from the solution. Solvato-controlled doping by adding pyridine as ligand helped solve this problem when used anhydrous ferric chloride or aluminium chloride as the doping agent.

Copolymerization between EDOT and 3-hexylthiophene with anhydrous ferric chloride did not give the expected improved property of the polymer in comparison to P3HT. Only small fractions of EDOT could be incorporated into the polymer under the experimental condition. More research on the variation of the polymerization methods is needed.