CHAPTER V

CONCLUSION

Polypyrrole composite as a particle with high conductivity could be prepared by chemical polymerization of pyrrole in the presence of different host polymers. Pyrrole volume, reaction time, solvent and reaction temperature influence the conductivity of polypyrrole composites. It can be concluded that the best polypyrrole composite can be achieved when the reaction is carried out at high oxidant concentration (2.5 M) and low temperature for 1 hour in either 50% of methanol/water by volume or methanol. However, at a temperature beneath 0 °C, lower conductivity is obtained. In particular, at -20 °C no polymerization occurs.

Among these factors, the amount of pyrrole in the reaction is the most crucial factor. It seems that the conductivity threshold level of polystyrene/ polypyrrole and poly(vinyl chloride)/polypyrrole composite is at 0.5 and 0.8 pyrrole ratio, respectively.

The rate of conductivity decay of both polystyrene/polypyrrole and poly(vinyl chloride)/polypyrrole composite is faster when the pyrrole volume is higher. Comparing the conductivity decay of polystyrene/polypyrrole composite with poly (vinyl chloride)/polypyrrole composite at 0.8 and 1 pyrrole weight ratio, the rate of conductivity decay is about the same, but at 0.5 pyrrole ratio, the conductivity of poly (vinyl chloride)/polypyrrole composite decays at much faster rate than polystyrene/polypyrrole composite. Polystyrene/polypyrrole composite prepared from the reaction using 0.5 pyrrole ratio, 2.5 M $FeCl_3$ solution, methanol solvent and 0 °C reaction temperature is a promising conductive material. Its conductivity is 7.57

Scm^{-1}. This study also indicates that under the reaction condition mentioned above is selective. It can occur well on PS and PVC, but not on PE and PP.

The other type of polypyrrole. synthesized in the absence of host polymer but in the presence of poly(vinyl pyrrolidone) in 50% methanol/water, 0 °C reaction temperature, 1 hour reaction time, and 1 pyrrole ratio, exhibits conductivity of 42 Scm^{-1}. It is noticed that such polypyrrole is interesting since it shows higher conductivity than the one with mild condition [41,42]. Furthermore, it was found that using PVP as stabilizer during polymerization could increase the dispersity of particles of polypyrrole. Scanning electron microscope shows that these particles were much more dispersed than another obtained from the reaction without PVP, although some aggregation was observed.