CHAPTER V
CONCLUSIONS

The PDMA synthesized shows the reversible color change from yellow to green representing the transition between the leucoemeraldine (reduced state) and emeraldine (oxidized state) upon the switching potentials. The PDMA/ITO electropolymerized in oxalic, nitric, and hydrochloric acids have mostly the same structural property, the only difference is the FTIR band of the oxalate and nitrate groups acting as counter ions with the protonated amine. The decomposition temperatures from the TGA curves of the PDMA synthesized in three acids occur at three steps: ~130 °C, 300 °C, and 450 °C. The important differences of the PDMA synthesized in various acids are the morphology and the thickness of PDMA films at the same dipping time, both factors lead to the variations of the response time and the optical contrast.

The UV-VIS absorption spectra show two absorption bands at 480 nm and 750 nm corresponding to the leucoemeraldine and pernigraniline forms, respectively. The band at 480 nm represents the reduction process whereas the band at 750 nm corresponds to the oxidation state of PDMA.

From the study of the response time of the PDMA synthesized from various acids, the increase of polymerization time contributes to the increase in the response time due to the increase in the thickness of the PDMA film. On the other hand, the increase of the applied potentials leads to the decrease in the response time. Moreover, the PDMA from hydrochloric acid shows the fastest response time (3.7 s.) in all acids at the same dipping time because the resultant thinnest film from the slow polymerization rate in hydrochloric acid.

The study of the effect of the electrolyte concentration indicates that the increase of the electrolyte concentration from 10^{-6} to 10^{-1} M results in more than a factor of 20 in the reduction of the response time. The optical contrast of the PDMA films slightly increases when the polymerization time increases from 6 to 10 minutes. PDMA synthesized with the same dipping time shows the optical contrast in the order of nitric acid > oxalic acid > hydrochloric acid.

The cyclic voltammetry shows the shift of the oxidation-reduction potentials of the PDMA synthesized from all acids to being more positive and negative, respectively with the increase in the polymerization time, due the greater diffusion time of the counter ion for the redox reaction through the thicker film.