ELECTRICAL, OPTICAL AND IONIC TRANSPORT STUDY OF CHITOSAN-ADIPIC ACID PROTON CONDUCTING POLYMER ELECTROLYTE

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To my husband who has always encouraged me to do the best and supported me wholeheartedly in everything I pursued.

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A proton conducting polymer electrolyte film is presented in this work. The proton conducting polymer electrolytes presented in this thesis consist of chitosan (CA) as polymer host and adipic acid (AA). The sample was prepared by using the solution cast technique. AA is a weak dicarboxylic acid and used as the proton donor. The salt was varied between 10 and 45 wt.% in the preparation of the polymer electrolytes. The highest conductivity obtained was 1.4×10^{-9} Scm^{-1} for sample containing 35 wt.% of AA at room temperature.

In FTIR studies, the interaction between CA and AA can be observed at wavenumber 1639, 1549, 1457, 1403, 1152, 1072 and 1031 cm^{-1}. The peak at1457 cm^{-1} and 1403 cm^{-1} was indicative of the COO^- vibration mode. COO^-

can only occur if AA has dissociated. The plot temperature dependence of conductivity shows the Arrhenius behavior with the highest conductivity gives low activation energy. Calculations using the Rice and Roth model provide mobility, diffusion coefficient and number of charge carrier values for the mobile ions. The ionic conduction process suggested was occurred by means of hopping mechanism. The ionic conductivity of CA-AA polymer electrolyte was controlled by diffusion coefficient and mobility.

Results from the transference number measurement, the diffusion phenomena was correlated to the conductivity behavior of CA-AA polymer electrolyte. It was shown that the value of cationic mobility (μ_+) was higher than the value of anionic mobility (μ_-) and diffusion coefficient of cation (D_+) was higher than diffusion coefficient of anion (D_-) and it proved that the samples were more cationic than anionic conductor. From the result obtained shows that the CA-AA is a proton-conducting polymer electrolyte.