Searching a new material for the development of proton conducting polymer electrolytes that can be used in protonic electrochemical cells is the focus of this research study. In this study, the proton conducting polymer electrolytes were prepared by solution cast technique. Poly (vinyl chloride) PVC is used as the polymer host, ammonium triflate (NH₄CF₃SO₃) as the doping salt and ethylene carbonate (EC) and butytrimethyl ammonium bis trifluoromethyl sulfonyl imide (Bu₃MeNTf₂N) is used as the plasticizers. Characterization techniques of EIS, XRD, FTIR, FESEM, DSC, TGA, transference number and linear sweep voltammetry measurements were used to study the properties of the PVC based proton conducting polymer electrolytes. Pure PVC exhibits room temperature ionic conductivity of 1.55 × 10⁻¹⁰ S cm⁻¹. Various combinations of PVC and NH₄CF₃SO₃ compositions were attempted and the highest conductivity achieved was 2.50 × 10⁻⁷ S cm⁻¹ when 30 wt. % NH₄CF₃SO₃ (A4) was incorporated into PVC which is an increase of about three orders of magnitude. The increase in conductivity with addition of NH₄CF₃SO₃ is attributed to increase in number of mobile ions and decrease in crystallinity of the films as shown by XRD, FESEM and DSC results. A further increase in ionic conductivity is observed when the polymer-salt electrolyte with the highest conductivity (A4) was added with plasticizers EC and Bu₃MeNTf₂N. The highest ionic conductivity achieved was 3.06 × 10⁻⁵ S cm⁻¹ when 5 wt. % of EC (B1) was incorporated to the A4 polymer electrolyte. When 15 wt. % Bu₃MeNTf₂N (C3) was added to the A4 polymer electrolyte, the highest ionic conductivity achieved was 1.56 × 10⁻⁴ S cm⁻¹. Temperature dependence of conductivity study showed that conductivity increased with temperature and is found to obey the Arrhenius relationship. XRD studies showed that amorphous PVC becomes largely amorphous in nature upon addition of NH₄CF₃SO₃. Largely amorphous in nature is also obtained upon addition of NH₄CF₃SO₃. Xc is obtained by DSC and showed that the plasticized system has lower fraction of crystallinity compared to the salted systems with Bu₃MeNTf₂N plasticized system having concentration of 15 wt. % (C3) having the least crystallinity. The transference number of this electrolyte is found to be 0.82 while its electrochemical window stability is 1.8 V. Electrochemical cells were fabricated using C3 electrolytes. The cells were discharged at different loads of 1.5 kΩ, 62 kΩ and 95 kΩ. The OCV of a cell based on the highest conducting electrolyte with configuration: Zn+ZnSO₄.7H₂O+PTFE | 85 wt. % (PVC-NH₄CF₃SO₃) +15 wt. % Bu₃MeNTf₂N (C3) | MnO₂+PTFE is ~ 1.52 V while its discharge capacity is 0.55 mA h. The discharge performance of the cells showed that the protonic polymer electrolyte film proposed in this work has potential for application in protonic electrochemical cells for proton battery.

During canning and juice processing of pineapple, pineapple peel usually discharged. Discharged of pineapple peel during these productions will produce waste and lead to serious environmental pollution. In industrial practices, pineapple waste is either used as animal feed or disposed to the soil as waste. Pineapple peel contain valuable natural enzyme which is bromelain. Bromelain is enzyme which believed to have many benefits and very promising to the development of food and pharmaceutical industries. The purpose of this study is to isolate leucine from beef by using purified bromelain from pineapple peel extract. Purified bromelain powder from pineapple peel was produced through purification process. These include extraction from pineapple peel using purified water as a medium extraction, purification by cation exchange chromatography, desalting using continuous diafiltrator and followed by freeze drying. Each step was found to produce different effect on bromelain activity, protein content, specific enzyme activity and purification level. It was found that bromelain extracted from 100g of pineapple peel could yield 1.0g of bromelain powder. The amino acid composition in 14 beef cuts was also determined in this study. The flank cut was found to contain significantly higher amount of leucine amongst the beef cuts. The enzymatic hydrolysis was done with bromelain enzyme as a substrate to produce beef protein hydrolysate with higher content of leucine. The optimisation condition for the isolation of leucine was found with bromelain concentration of 1.38%, hydrolysis temperature of 42.5°C and hydrolysis time of 31.59 hours. The isolation of leucine was done by cation exchange chromatography and followed by freeze drying to obtain leucine powder. The leucine produce are as crystalline solid form, clean and white deposit. This leucine powder was used to determine the secretion of insulin in plasma of male Sprague-Dawley rats. It was found that the mean plasma insulin concentration value was achieved maximum at 90 minutes and 180 minutes for intramuscular injection and oral, respectively after leucine administered. The percentage of insulin increment for both intramuscular injection and oral administration of leucine are 80.40% and 79.02%, respectively.

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