ABSTRACT

In this work, N-Phthaloylchitosan (PhCh) was first synthesized via phthaloylation using chitosan. The structure of PhCh has been confirmed using FTIR and ^{1}H NMR spectroscopy. From FTIR spectroscopy, characteristic peaks of phthalimido and aromatic group from PhCh are observed at 1772, 1708, and 719 cm^{-1} respectively while ^{1}H NMR spectrum shows two sets of peaks centered at 3.0 and 7.5 ppm verifying that chitosan has been phthaloylated. The presence of the bulky phthalimido groups in PhCh results in the reduction of inter- and intramoleculear hydrogen bonds of the chitosan, resulting in solubility in some organic solvents such as DMF, DMSO, DMAc and pyridine. XRD results shows that the nature of PhCh is less crystalline compared to the chitosan. Polymer electrolytes based on PhCh have been prepared by varying the weight percentages of lithium iodide (LiI) from 5 to 50. The presence of an amide peak at 1650 cm^{-1} in the salt added spectra might be due to the ring-opening of phthalimido group to give an amide and a carboxylic acid group. Simultaneously, the three main peaks assigned to PhCh decrease with increase in LiI content. Conductivity value of 1.80 x 10^{-10} S cm^{-1}, obtained for pure PhCh film is observed to increase after addition of LiI. A maximum conductivity of 1.87 x 10^{-4} S cm^{-1} is achieved after addition of with 50 wt. % of LiI. Relationship between conductivity and temperature of PhCh doped with LiI obeys Arrhenius law. PhCh/50 wt. % LiI/I_2 was used as the solid polymer electrolyte in dye-sensitized solar cells (DSSCs), Solar cell with an active area of 0.25 cm^{2}. The open circuit voltage, V_{OC} are 0.32 V and 0.28 V, the short circuit current density, J_{SC} achieved are 1.22 mA cm^{-2} and 0.25 mA cm^{-2} for black rice and red cabbage sensitized solar cell, respectively.