Biocellulose (BC) impregnated with carbon nanotube (CNTs) for zinc air fuel cell application

ABSTRACT

Bacterial cellulose (BC) and bacterial cellulose impregnated with carbon nanotubes (BC/CNTs Bio-composite) was synthesized in this project. An investigation on the characteristic of BC and BC/CNTs bio-composite and its performance as electrochemical separator in zinc air fuel cell was done. BC/CNTs bio-composite was synthesized using new CNTs impregnation method, namely spraying method. Bacterium, Acetobacter xylinum was used for fermentation. Three manipulating parameters were used. First, BC-CNTs bio-composite was synthesized in 5 days, 7 days and 10 days of fermentation. Then, amount of CNTs impregnated into BC/CNTs bio-composite was varied. 0.02% CNTs, 0.05% CNTs and 0.08% CNTs were used. Third, two types of CNTs were used, namely CNTs synthesized via floating catalyst chemical vapour deposition (FC-CVD) and CNTs synthesized via fixed bed chemical vapour deposition (FB-CVD). From the results, BC-CNTs bio-composite shows better conductivities (42.7 S/m at 2.00E+10 Hz), and higher thermal stability. BC/CNTs bio-composite impregnated with CNTs FB-CVD and CNTs FC-CVD did not shows any significant different in their electrical conductivities and thermal stability in analytical test. BC and BC/CNTs bio-composite were used as electrochemical separator in zinc air fuel cell. About six cells were able to move a toy car that required 1.5V. The shelf life of cell was estimated to be 12 minutes 24 second. In conclusion, BC and BC/CNTs bio-composite are conductive materials. BC/CNTs bio-composite can be alternative used as electrochemical separator in zinc air fuel cell.

Keyword: Acetobacter xylinum; Fermentation; Biocomposite; Carbon nanotube (CNTs); Zinc air fuel cell