Isolation of Microcrystalline Cellulose (MCC) from Oil Palm Frond as Potential Natural Filler for PVA-LiClO₄ Polymer Electrolyte

M. Hazwan Hussin^{1,*}, Nurhanina Ayu Husin¹, Ibrahim Bello¹, Nurmaizatulhana Othman¹, Mohamad Abu Bakar¹, M.K. Mohamad Haafiz²

¹ Materials Technology Research Group (MaTReC), School of Chemical Sciences, Universiti Sains Malaysia, 11800 Minden, Penang, Malaysia.

² School of Industrial Technology, Universiti Sains Malaysia, 11800 Minden, Penang, Malaysia.

*E-mail: mhh@usm.my; mhh.usm@gmail.com

doi: 10.20964/2018.04.06

Received: 6 December 2017 / Accepted: 22 January 2018 / Published: 6 March 2018

In this study, microcrystalline cellulose (MCC) was extracted from organosolv oil palm fronds (OPF) pulp *via* acid hydrolysis method. The isolated OPF-MCC were characterized using complementary analysis such as FTIR, CP/MAS ¹³C NMR, XRD, GPC, TGA, DSC, SEM and N₂-BET. It was found that the isolated OPFMCC was identified as cellulose type I polymorph with high crystallinity index than α -cellulose ($CrI_{OPF\ MCC} : 76.38\ \% > CrI_{\alpha\text{-cellulose}} : 73.37\ \%$). The obtained OPFMCC was then incorporated with PVA-LiClO₄ at different LiClO₄ loading (0, 5, 10, 15, 20 %) through solution casting technique to produce biodegradable polymer electrolytes of OPFMCC-PVA-LiClO₄. The fabricated films were further analyzed using electrochemical impedance spectroscopy (EIS) and cyclic voltammetry (CV). It interesting to note that, a maximum conductivity was found to be $1.88 \times 10^{-4}\ S\ cm^{-1}$ for OPF MCC-PVA-20 % LiClO₄ with electrochemical stability window potential around 1.9 V.

Keywords: Oil palm frond; microcrystalline cellulose; polymer electrolytes.

[FULL TEXT](#)

© 2018 The Authors. Published by ESG (www.electrochemsci.org). This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution license (<http://creativecommons.org/licenses/by/4.0/>).