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Ahmad Shahrim, N.[a] , Ahmad, Z.[a] , Masaad, I.S.[a] , Zamros, N.A.[a] , Azman, A.W.[b] , Sarifuddin, N.[a] , Yose, F.B.[c]

Comparative Studies on the Electrical Properties of PEDOT:PSS Doped SNP Films and Hydrogels for Medical Electrode Applications

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[a] Department of Manufacturing and Materials Engineering, Kulliyyah of Engineering, International Islamic University Malaysia, Kuala Lumpur, Malaysia

[b] Department of Electrical and Computer Engineering, Kulliyyah of Engineering, International Islamic University Malaysia, Kuala Lumpur, Malaysia

[c] Department of Mechanical Engineering, Faculty of Engineering, University of Malaya, Kuala Lumpur, Malaysia

Abstract

Poly(3,4-ethylene dioxythiophene):poly(styrene sulfonate) (PEDOT:PSS) is a promising conductive polymer to be the next-generation electrode for medical purposes. However, PEDOT:PSS exhibits low conductivity (~1×10−3 S cm−1); hence, incorporating silver nanoparticles (SNP) with PEDOT:PSS will improve the electrical conductivity. This paper aims to investigate the electrical properties differences between PEDOT:PSS doped SNP-based films and hydrogels. The two different states of PEDOT:PSS/SNP serves its particular purpose as an electrode. Initially, the PEDOT:PSS/SNP solution was prepared by homogeneously mixing at constant stirring. Then, the solution was drop-casting onto a glass substrate to produce a film, while another part of the solution was undergoing a freeze-thaw method to produce hydrogel. Surface resistance measurement exhibits lower resistance values for a film (0.11 kΩ) than hydrogel (0.59 kΩ). A scanning electron microscope (SEM) was utilized to observe the morphology of the films, while an optical microscope (OM) observed the surface of the hydrogel since they are in different states. Fourier Transform Infrared (FTIR) spectra display prominent peaks that described the successful blending between PEDOT:PSS and SNP for both films and hydrogels. These findings demonstrate that varying processing methods of preparing PEDOT:PSS/SNP in films or hydrogels may influence its properties like the electrode, which should provide a valuable contribution to the bioelectronic areas. © 2022 Trans Tech Publications Ltd, Switzerland.

Author Keywords

electrical properties; electrode; films; hydrogels; PEDOT:PSS

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Correspondence Address
Ahmad Z.; Department of Manufacturing and Materials Engineering, Malaysia; email: zuraidaa@iium.edu.my

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