

## Research article

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# Multiwalled Carbon Nanotube/PEDOT: PSS Coated on Pineapple Fiber Paper Based Flexible Electrode for Electrochemical Application

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### Abstract

#### Keywords

green electrode;  
pineapple fiber paper;  
flexible electrode

In this study, a green electrode made from natural fiber paper was investigated. A pineapple fiber paper was used as electrode support material. A mixture of multiwalled carbon nanotubes and PEDOT: PSS (MWCNTs/ PEDOT: PSS) was used as active electrode material. PEDOT: PSS, a conducting polymer, was applied as binder to connect between MWCNTs and the surface of pineapple fiber paper, and this setup showed decrease in electrode resistivity. Varying the MWCNT concentration mixed with PEDOT: PSS on pineapple fiber paper was explored. The 3 wt.% MWCNT device gave the maximum conductivity value of 10.87 S cm<sup>-1</sup>. Cyclic voltammetry and impedance analysis indicated that 3 wt.% MWCNT device showed considerable promise as a flexible electrode for electrochemical devices for energy storage applications.

### 1. Introduction

Flexible electrodes have attracted much attention in the energy storage field such as lithium-ion batteries [1] and electrochemical capacitors [2, 3]. This is due to their promising properties, i.e. being flexible, portable, lightweight, and bendable. Some natural fibers are good candidates for flexible electrode substrate materials because they can be formed into carbon structures with hollow pores and good electrical conductivity [3]. Pineapple is one of the largest agricultural products in Thailand. From 2008 to 2018, Thailand produced an average of 2,096.44 thousand tonnes/year of pineapples [4]. This production created a large volume of plant-based wastes. A large amount of

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