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PREPARATION OF COPPER OXIDE NANOSTRUCTURE AS BUFFER LAYER ON ELECTRODE MATERIALS FOR MONITORING THE ELECTRICAL PROPERTIES OF FERROELECTRIC POLYMER

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ABSTRACT

In this work, we adopted a one-pot synthesis of CuO/Cu_2O nanostructures in selective etchantby facile chemical etching process of Cu substrate. In addition, we avoided the used of additional oxidant. The surfaces of etched copper substrates were tarnished when viewed by the naked eye. It has been observed that the uniformity, shape and size of the nano-arrays on the Cu-substrates could be conveniently controlled by etching time and concentration of the etchant. The UV–visible absorption spectra of the nano-arrays are blue-shifted probably due to the size reduction, and this is attributed to quantum-confinement effect. Furthermore, the growth of copper oxide nano-arrays on Cu-substrates might be easily integratable as an electrode buffer layer for improving the dielectric properties of Poly(vinylidene fluoride) (PVDF). It is noteworthy to mention that the high sensitivity, low detection limit, excellent stability, brilliant reproducibility and good anti-interference ability of the nano-arrays on copper substrates could have diversity of potential candidate for routine analysis of glucose concentrations in human blood serum or other biological fluids.

Keywords: Copper nanoarray, PVDF-nanocomposite, Dielectric Permittivity, Glucose Sensing.

INTRODUCTION

Energy conversion and storage are the two most important technologies in the field of renewable energy. Recently demonstrated a new fundamental mechanism that directly hybridizes energy conversion and storage processes into one step, through which the mechanical energy is directly converted and simultaneously stored as electrochemical energy [1]. Polymer nanocomposites with high dielectric permittivity have great potential to store electrical energy and therefore to be used in a broad range of applications, such as communications devices, actuators, artificial muscles, charge-storage capacitors systems, etc [2-4].

In this study, we present poly(vinylidene fluoride) (PVDF) films on copper oxide nanoarrays with higher dielectric permittivity and lower dissipation factor. The study behind improvement of dielectric properties of PVDF was chosen because of this semi-crystalline engineering polymer has extensive applications due to its great thermal stability, chemical resistance, and electroactive (ferro, pyro, piezoelectric) properties [2,5,6].