CHARACTERIZATION AND CONDUCTIVE PROPERTIES OF EPOXY FILLED-GRAPHENE CONDUCTIVE INK VIA GREEN CO-SOLVENT METHOD

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ABSTRACT

CHARACTERIZATION AND CONDUCTIVE PROPERTIES OF EPOXY FILLED-GRAPHENE CONDUCTIVE INK VIA GREEN CO-SOLVENT METHOD

Conductive ink main function is to connect areas that need to be electrically active. Creating a good conductive ink using simple, low-cost methods is important to the development of printed electronics. One of the matrix materials used in the conductive ink is epoxy resin. Epoxy has many advantages as a superior adhesive and mechanical qualities, as well as its adaptability in terms of curing agent and filler options. However, epoxy cannot conduct electricity by itself. Hence, graphene is used as a filler due to its great electrical conductivity. The objectives of this study are to prepare and characterize the epoxy filled with various graphene (0 wt%, 5 wt%, 10 wt%, 15 wt% and 20 wt %) and to identify the optimum Graphene loadings on its conductive property. The co-solvent method with 2:1 ethanol:distilled water ratio was used in this experiment's mixing. Mixing was conducted using a sonicator and the samples was printed on the PET substrate using print screen method. The produced conductive ink was undergone Fourier-transform infrared spectroscopy (FTIR), Ultraviolet-Visible Diffuse Reflactance Spectra (UV-Vis) and futher investigating using multimeter and Electrical impedance spectroscopy (EIS). From the study, both multimeter and EIS show similar trend, where the conductivity increase as the graphene loadings in the ink increased from 0% to 15% and decreased at 20%. Graphene provide high surface area that increase graphene sheet-epoxy matrix interaction. Increased contact area promotes the movement of electrons, thus improve the conductivity. The 15% Graphene loadings was found optimal as it has highest value of conductivity which is 7.496×10^{-4} S/m and 0.016 S/m which were identified using multimeter and EIS respectively.

TABLE OF CONTENTS