UNIVERSITI TEKNOLOGI MARA

THE ELECTRICAL AND OPTICAL STUDIES OF GRAPHENE OXIDE DOPED PEDOT:PSS THIN FILM

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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

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ABSTRACT

A promising candidate for transparent conductive electrode materials is the thin film of poly(3,4-ethylenedioxythiophene)(polystyrene sulfonate) (PEDOT: PSS) and graphene oxide (GO) . Spin coating technique was used in this research to produce thin films from PEDOT: PSS / GO. Graphene oxide sheets have been spread uniformly in PEDOT: PSS aqueous solution. The fabricated PEDOT:PSS/GO thin films have demonstrated an outstanding electrical properties. The electrical conductivity of PEDOT:PSS thin films have achieved 35.80 S/cm, which have been increased about 5 times when 5% of graphene oxide was added into the solution. This exceptional improvement is attributed to the higher carrier mobility, because GO interacts with PEDOT via π-π stacking and hydrogen bonding. The solution-processing of PEDOT:PSS/GO was simplified in this experiment to promote the commercialization of economical flexible electronic devices. The best optical band gap is obtained from PEDOT:PSS/5%GO which is 4.37 eV. Electrical characterization of the Schottky diodes device was performed using current–voltage (I–V) measurements. The Schottky diodes showed good rectifying behaviour. Fascinatingly, for 5% doping of GO, the Schottky diode showed the best diode characteristics with an ideality factor, η of 2.79 and barrier height, Φ_b 0.5949 eV compared with pristine PEDOT:PSS Schottky diode of 4.25 of ideality factor, η and barrier height of 0.4913 eV. The embedded GO in PEDOT:PSS improves the conductivity of thin films, as well as optical band gap which subsequently enhance its electrical performance in Schottky diode devices. Thus, PEDOT:PSS/5%GO shows better performance compared to pristine PEDOT:PSS

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