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Developing Manufacturing Process for the Graphene Sensors

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Abstract : Biosensors play a significant role in the healthcare sectors, scientific and technological progress. Developing electrodes that are easy to manufacture and deliver better electrochemical performance is advantageous for diagnostics and biosensing. They can be implemented extensively in various analytical tasks such as drug discovery, food safety, medical diagnostics, process controls, security and defence, in addition to environmental monitoring. Development of biosensors aims to create high-performance electrochemical electrodes for diagnostics and biosensing. A biosensor is a device that inspects the biological and chemical reactions generated by the biological sample. A biosensor carries out biological detection via a linked transducer and transmits the biological response into an electrical signal; stability, selectivity, and sensitivity are the dynamic and static characteristics that affect and dictate the quality and performance of biosensors. In this research, a developed experimental study for laser scribing technique for graphene oxide inside a vacuum chamber for processing of graphene oxide is presented. The processing of graphene oxide (GO) was achieved using the laser scribing technique. The effect of the laser scribing on the reduction of GO was investigated under two conditions: atmosphere and vacuum. GO solvent was coated onto a LightScribe DVD. The laser scribing technique was applied to reduce GO layers to generate rGO. The micro-details for the morphological structures of rGO and GO were visualised using scanning electron microscopy (SEM) and Raman spectroscopy so that they could be examined. The first electrode was a traditional graphene-based electrode model, made under normal atmospheric conditions, whereas the second model was a developed graphene electrode fabricated under a vacuum state using a vacuum chamber. The purpose was to control the vacuum conditions, such as the air pressure and the temperature during the fabrication process. The parameters to be assessed include the layer thickness and the continuous environment. Results presented show high accuracy and repeatability achieving low cost productivity.

Keywords : laser scribing, lightscribe DVD, graphene oxide, scanning electron microscopy
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