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Optimization the Conditions of Electrophoretic Deposition Fabrication of Graphene-Based Electrode to Consider Applications in Electro-Optical Sensors

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Abstract : Graphene has gained much attention owing to its unique optical and electrical properties. Charge carriers in graphene sheets (GS) carry out a linear dispersion relation near the Fermi energy and behave as massless Dirac fermions resulting in unusual attributes such as the quantum Hall effect and ambipolar electric field effect. It also exhibits nondispersive transport characteristics with an extremely high electron mobility (15000 cm²/(Vs)) at room temperature. Recently, several progresses have been achieved in the fabrication of single- or multilayer GS for functional device applications in the fields of optoelectronic such as field-effect transistors ultrasensitive sensors and organic photovoltaic cells. In addition to device applications, graphene also can serve as reinforcement to enhance mechanical, thermal, or electrical properties of composite materials. Electrophoretic deposition (EPD) is an attractive method for development of various coatings and films. It readily applied to any powdered solid that forms a stable suspension. The deposition parameters were controlled in various thicknesses. In this study, the graphene electrodeposition conditions were optimized. The results were obtained from SEM, Ohm resistance measuring technique and AFM characteristic tests. The minimum sheet resistance of electrodeposited reduced graphene oxide layers is achieved at conditions of 2 V in 10 s and it is annealed at 200 °C for 1 minute.

Keywords : electrophoretic deposition (EPD), graphene oxide (GO), electrical conductivity, electro-optical devices
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