Water Based Graphene/AgNPs Direct Writing Conductive Ink and Their Application in Electrical Patterns for Chemical Sensor

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Abstract: A conductive inkbased graphene is a novel innovation which can be used for fountain pen and inkjetprinter. The advantage of this conductive ink iseasy to design in complex pattern applying for electrical pattern on the flexible interdigited substrate. Moreover, this conductive ink can be easily dispersed in water medium as well as friendly-environment process. In our research, we focus on the study and development of the electrical property of the conductive ink based grapheneby using a modified Hummer method. A few-layered graphene oxide (FGO)synthesizedby controlling the oxidation level of graphite is proposed to obtain the large graphene sheet in multilayer form. As results, the FGO exhibited the better electrical conductivity property than that of graphene oxide obtainedby classical Hummer method due to the larger flake size of FGO [1]. The various concentration of FGOinks(at 10,15, 20 and 30 mg/ml in water)are prepared and written on polyethylene terephthalate (PET) substrate and treated polyethylene terephthalate-polystyrene sulfonate/polyethylenimine (treated PET-PSS/PEI) substrate. Interestingly,the both substrate exhibited the well absorption of FGO ink, indicating writing ability of FGO on polar and non-polar surface. However, it found that the improvement of PETsubstrate by treating with PSS/PEI showed the fast rate of FGO absorption on substrate, supportingthe excellent for fast writing. The conductivity property of FGO is increased after reducing FGO ink with ascorbic acid, owning to conductive form of the reduced few-layered graphene oxide (RFGO). In final step, the silver nanoparticle is introduced in RFGO inkswhich can increase an electrical conductive properties more than thousand times. This RFGO/Ag inks is expected to use as a novel class of conductive ink which can be appliedfor the flexible interdigited substrate pattern in sensor array.

Keywords:conductive ink, graphene, few-layered graphene oxide, silver nanoparticle

Reference:

[1] L. Zhang, X. Li et al., *Controlled synthesis of few-layered graphene sheets on a large scale using chemical exfoliation*, **CARBON 48 (2010)**, 2367 –2371

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