

Graphene Oxide Sol-Gel Nano Interdigitated sensor

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Abstract

Using graphene derivatives (graphene oxide (GO) and reduce graphene oxide (rGO)) in gel form, solution-process and ink are commonly used in fabrication of rGO and GO based devices [1, 2]. Here, we report the fabrication of a graphene oxide sol gel (GOSG) gas sensor/photodetector by controlling its width utilizing PMMA and oxygen plasma etching. A film of GOSG was completely etched to form an active area (channel) that touches interdigitated electrodes with side interface (see Fig.1a). The GOSG placed exactly between the interdigitated electrodes without any GO gel above or under the electrodes which allows us to study the responsivity and sensitivity of device that has only side GOSG -metal interface. It was found that the width of GOSG decreases as the oxygen plasma etching time increases [3]. Additionally, the thickness of PMMA plays a significant role in side etching rate. The side etching rate of GOSG can controlled by adjusting the PMMA layer thickness, etching time and electron beam dose during the lithography process. (Fig.1b-1d). It was found that, by controlling the thickness of PMMA and the etching time the desired width of GOSG between electrodes can be achieved. This could open a new method in fabrication of electronic devices that based on liquid/ sol-gel form of rGO and GO since putting this type of materials between electrodes in nano scale is a quite challengeable due to spreading of liquids. Characterization of the sensors proposed here using different light sources is underway.

References

- 1- Hyun, W. J., Secor, E. B., Hersam, M. C., Frisbie, C. D., & Francis, L. F. *Advanced Materials*,27(1), (2015), 109-115.
- 2- Chang, H., Sun, Z., Yuan, Q., Ding, F., Tao, X., Yan, F., & Zheng, Z. *Advanced Materials*,22(43), (2010),4872-4876.
- 3- Wang, X., & Dai, H. *Nature chemistry*, 2(8), (2010), 661-665.

Figures

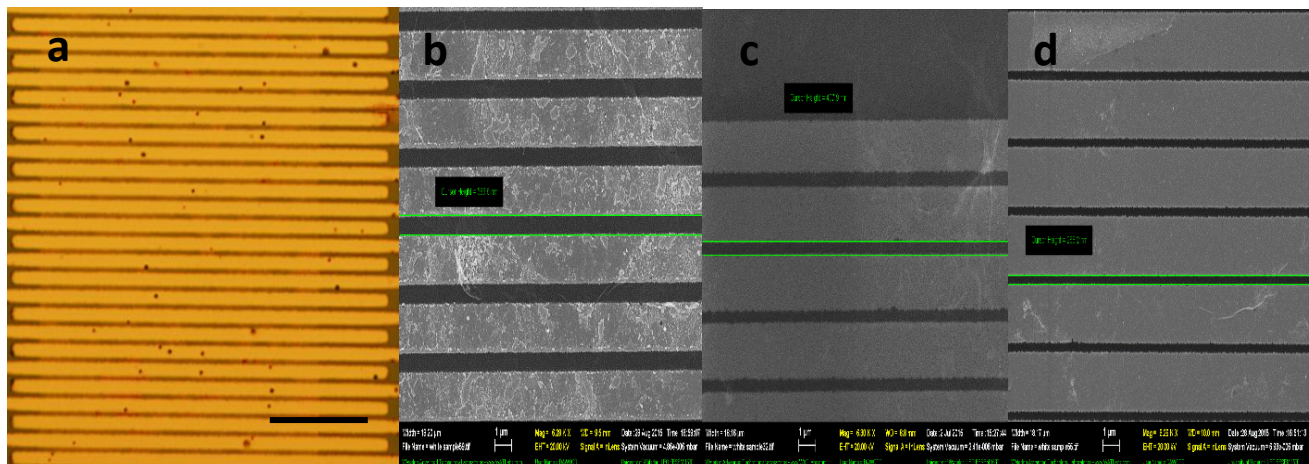


Figure1: a) An optical microscope image shows GOSG between interdigitated (scale is 10 μ m). B) The width of GOSG after 12 minutes etching (1185nm PMMA). C) After 16 minutes etching (1185nm PMMA). D) After 12 minutes etching (1090nm PMMA).