Multi-layered Conductive Films via Recursive Transfer-Print of Graphene onto Polymeric Foil

Ugur Yigit Inkaya [1]
Kubra Celik [2]
Ahmet Oral [1]

[1] *Middle East Technical University, Universiteler Mahallesi Dumlupınar Bulvarı No:1 06800 Cankaya, Ankara, Turkey*
[2] *Fırat University, 23119, Elazıg, Turkey*

e110658@metu.edu.tr

Abstract

Having zero bending stiffness [1], graphene is one of the most favourable materials for fabricating flexible electrodes. Graphene grown via chemical vapour deposition on copper foils can be transfer-printed onto a commercially available 80µm-thick polymeric lamination film by using hot rollers [2]. In order to form graphene-based multi-layered films on the lamination film, we recursively applied this transfer-printing method up to ten times (Figure 1). The resultant films were characterised via Hall-effect measurement and atomic force microscopy (AFM). As a result, a linear relation was observed between the density of charge carriers (holes) and the number of transfer-prints, indicating a layered structure (Figure 2). AFM study showed convergent behaviour in the RMS roughness with respect to the number of transfer-prints. Moreover, we performed Joule heating experiments by manufacturing flexible resistors via our recursive scheme. The experiments showed that the graphene-based films could withstand temperatures of up to 100°C.

References

[1] Changgu Lee et al, Science, 5887 (2008) 385
[2] Emre O. Polat et al., Scientific Reports, 4 (2014)

Figures

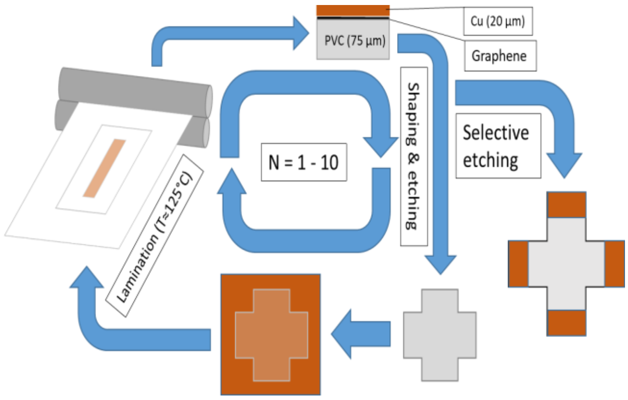

Figure 1: Schematics for the manufacturing process of the graphene-based multi-layered films on the polymeric lamination film

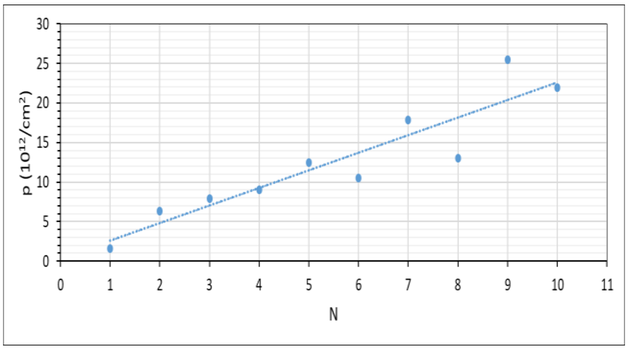

Figure 2: Hole density-vs-Number of transfer prints graph