Reduction of graphene oxide layers printed on different substrates

J. Jagiello[1], J. Ostrowska[1], L. Lipinska[1], Z. Sieradzki[2] , M. Puchalski[3], E. Skrzetuska[3], I. Krucinska[3], M. Rogala[4], I. Wlasny[4], Z. Klusek[4]

[1] Institute of Electronic Materials Technology, Wolczynska 133, 01-919 Warsaw, Poland

[2] Electrotechnological Company QWERTY Ltd., Siewna 21, 94-250 Lodz, Poland

[3] Department of Material and Commodity Sciences and Textile Metrology, Lodz University of Technology, Zeromskiego 116, 90-924 Lodz, Poland

[4] Department of Solid State Physics, Faculty of Physics and Applied Informatics, University of Lodz, Pomorska 149/153, 90-236 Lodz, Poland

joanna.jagiello@itme.edu.pl

Graphene exhibits superior electrical conductivity, high surface area and a broad electrochemical window that may be particularly advantageous for electronic application. In addition, graphene can be prepared in the form of a colloidal suspension with adjustable solubility and thus is suitable for printable electronics in an industrial scale and offers both transparency and good conductivity at the same time [1]. The most common form of graphene used as nanoelectronic components are graphene oxide (GO) and reduced graphene oxide (rGO). Although GO is not electrically conductive, it can be reduced to graphene thermally, chemically or photothermally. Chemical reduction of GO is the most common technique for the restoration of the graphene electronic structure [2,3].

In this work the results of reduction of GO layers are presented. Water suspension of graphene oxide was printed on four types of substrates: glass, flexible polyester foil (Autostat CT5), para-aramid (Kevlar) fabric and polyester fabric. GO layers were deposited with inkjet method. Graphene oxide was reduced by chemical methods with the use of various reducers: HI, HBr, KBH_4, NaH_2PO_2 with $NaHSO_3$, NH_4I and H_2SO_4. Different substrates require the use of appropriate reducers which do not react with the material and do not destroy its structure. We recorded Raman and XPS spectra for the samples to investigate the reduction efficiency. As it is shown in Fig.2., the D peak (1337 cm^{-1}) increased after reduction indicating the elimination of oxide groups from GO sheets and forming rGO. The sheet resistance varies from tens kΩ/□ to few kΩ/□ .

References

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Figures

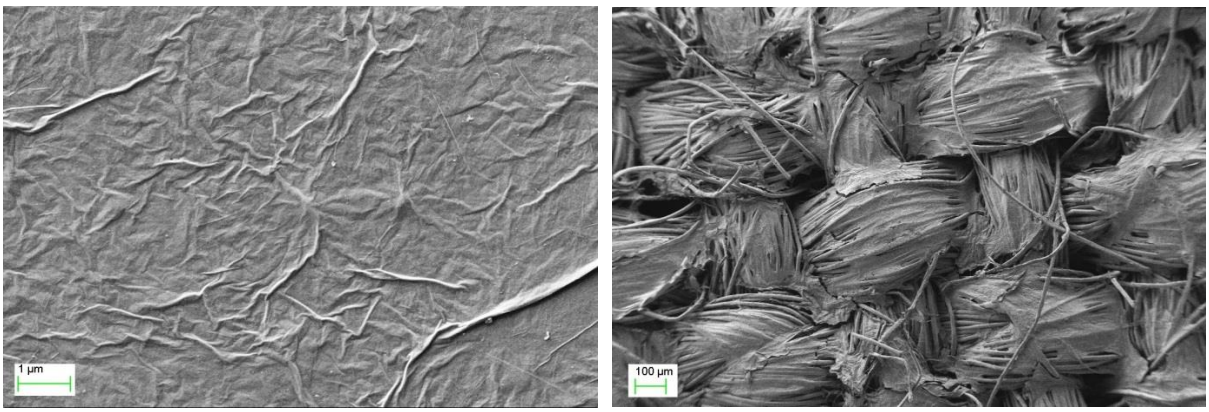

Fig.1. SEM images of GO printed on foil (left image) and on Kevlar fibers (right image).

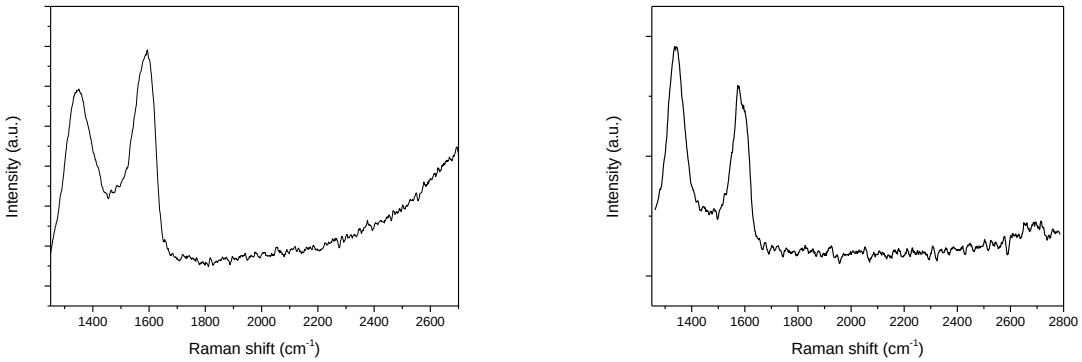

Fig.2. Raman spectra of GO (on the left) and rGO (on the right).

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