Exploring Laser-Induced Graphene for Sensing Applications: a Comprehensive Investigation

Antonio Lezzoche
Umar Farooq, Valentina Bertana, Sergio Ferrero, Michele Perlo, Luciano Scaltrito
Chilab-ITEM, Politecnico di Torino, Corso Duca degli Abruzzi 24, Turin, Italy
antonio.lezzoche@polito.it

In recent years, attention towards graphene-based materials has steadily increased, thanks to their numerous inherent properties such as high electrical conductivity, large surface area, and the ease of functionalization, among others [1]. For this reason, Laser Induced Graphene (LIG) appears to be one of the most extensively researched technologies during this period [2]. By irradiating a carbon material with a CO_2 laser in ambient atmosphere, the formation of a 3D layer of graphene material becomes feasible by LIG [3]. The aim of this study is to investigate the fabrication and the characterization of a graphene-based transductor using the LIG process on a polyimide substrate. Then, applications in different sensing fields will be presented exploiting the so-obtained conductance changes, depending on the process parameters.

References

[1] Virendra Singh et al, 'Graphene based materials: Past, present and future', Progress in Materials Science 56 (2011), 1178-1271
[2] Lin J. et al, 'Laser-induced porous graphene films from commercial polymers', Nat. Commun. 2014, 5, 5714
[3] M. Liu J. N. Wu, and H. Y. Cheng, 'Effects of laser processing parameters on properties of laser-induced graphene by irradiating CO2 laser on polyimide', Sci China Technol Sci, vol. 65, no. 1, pp. 41–52, Jan. 2022

Figures

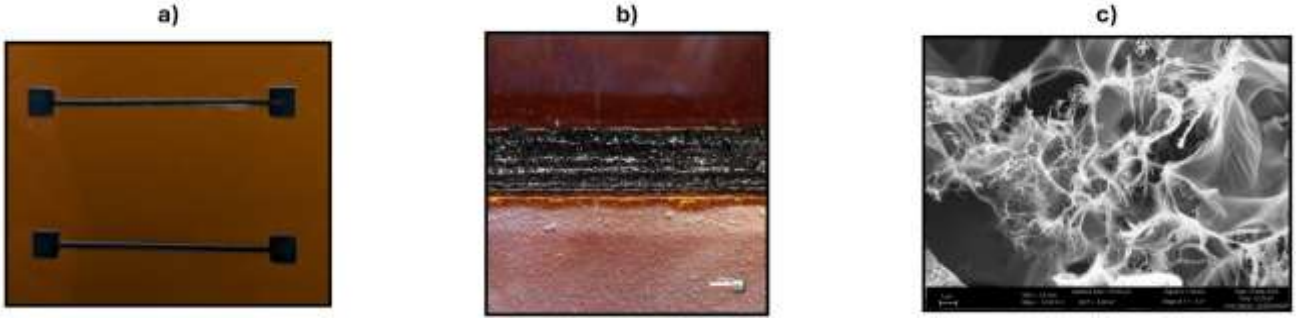

Figure 1: a) Fabricated sample – b) Image obtained with Olympus Microscope (scale bar: 190 µm) – c) FESEM analysis (scale bar: 1µm).

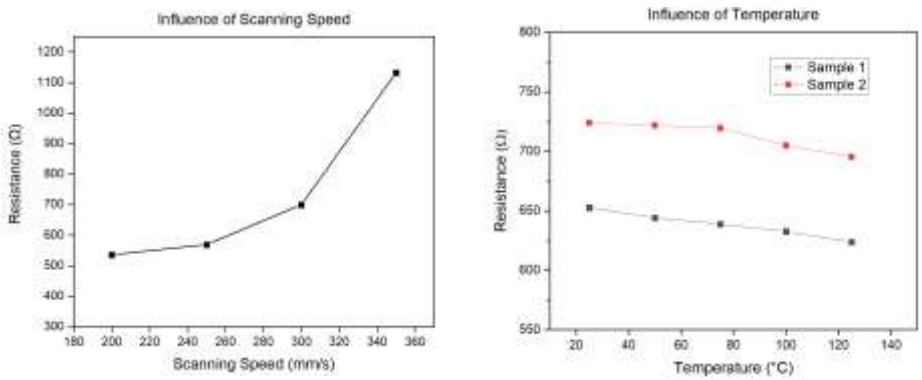

Figure 2: Influence of parameters on the sample resistance.