Laser printing and laser reduction of graphene oxide

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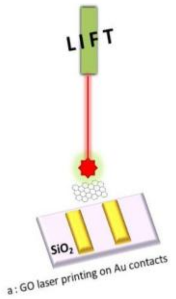
In this work, we present our recent results on the laser printing, using the Laser Induced Forward Technique, and the irradiation-mediated reduction of graphene oxide, exploiting the restoration of the sp^2 hybridized graphitic network, for the fabrication of resistive chemical sensors. Printing and reduction experiments were carried out using a pulsed ns Nd:YAG laser along with a high-power mask projection micromachining setup. A dedicated CCD camera was coupled with the optical setup, to monitor the deposition and reduction processes.
In general, three approaches (chemical, thermal and irradiation) have been used for the removal of the functional oxygenous groups from the hydrophilic graphene oxide basal plane, in order to obtain its reduced form [1], [2]. The restoration of the electrical conductivity can therefore be exploited in resistive chemical sensors. In this framework, we investigated the laser-assisted reduction of graphene oxide, using a pulsed laser (266 nm), so as to investigate the effect of pulse number and laser fluence on the reduction yield. Moreover, the laser printing conditions were also investigated, in terms of the fluence threshold for succesful deposition and the distance between the donor and receiver substrates, aiming to achieve the transfer of well-defined graphene oxide droplets, with homogeneous and reproducible flake dispersion.
The morphology of the deposited graphene oxide droplets has been characterized by optical microscopy, while the laser reduced graphene oxide structural and electrical properties, have been studied by means of optical microscopy, Raman spectroscopy and electrical measurements.



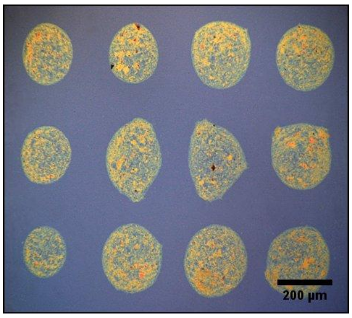


Figure 1: Schematic representation of GO printing on Au contacts (left) and laser printed GO droplets on SiO_2 (right)

References

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