Engineered CVD-Graphene as Transparent Conductive Electrodes for solar cells

G. V. Bianco,[1]
M. Losurdo,[1] M.M. Giangregorio,[1] P. Capezzuto,[1]
L. La Notte,[2] E. Villari,[2] A. Reale,[2] G. Bruno.[1]

(1) Institute of Nanotechnology, CNR-NANOTEC, Department of Chemistry, Università degli Studi di Bari, Via Orabona 4, 70126, Bari, Italy);
(2) CHOSE, Centre for Hybrid and Organic Solar Energy, Department of Electronic Engineering, University of Rome Tor Vergata, via del Politecnico 1, 00133, Rome, Italy.

giuseppevalerio.bianco@cnr.it

Abstract

The main issues for the exploitation of CVD-graphene as transparent conductive electrode in organic photovoltaics are the still high sheet resistance and the low wettability. We present two chemical strategies for (i) the stable p-doping of CVD graphene (reaching a sheet resistance value of 25 Ω/sq) and (ii) the improvement of the surface wettability (that results in a contact angle decrease form 90° to 58°). These consist, respectively on (i) the $SOCl_2$ thermal and (ii) O_2 plasma treatments of multilayer graphene samples.
The use of graphene engineered by these two distinct strategies as transparent electrodes on inverted polymer solar cells (PSCs) results in improved performances of devices. In particular, an average efficiency of about 4% on an active area of 10 mm^2 is found for PSCs based on engineered graphene, while the employment of pristine graphene provides an efficiency well below 1%.

References

[1] L. La Notte, G.V. Bianco, et al, Nanoscale, 9 (2017) 62.

Figures

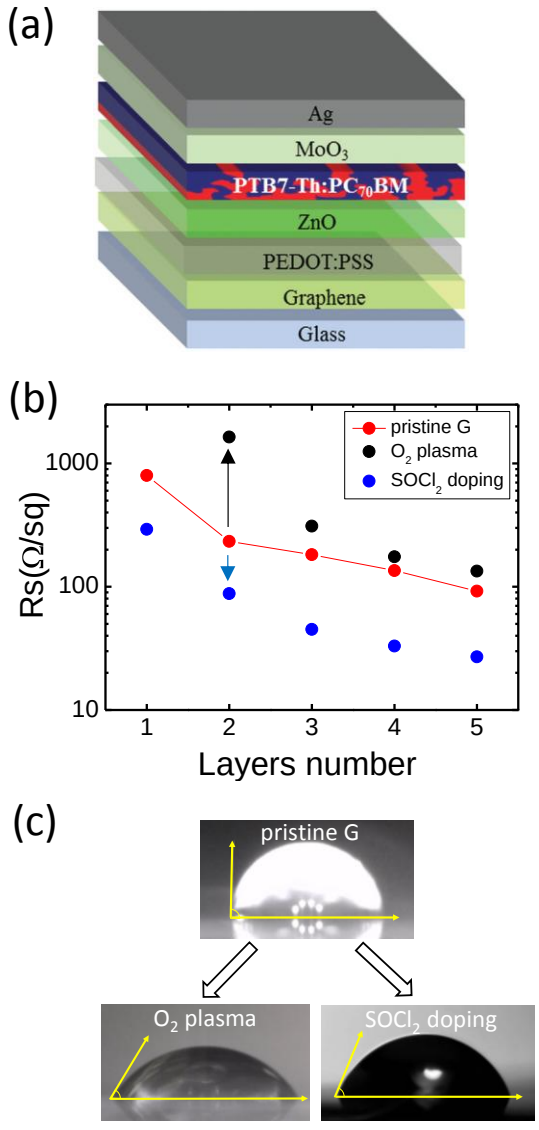

Figure: (a) Structure of the inverted polymer solar cell with CVD graphene as transparent electrode. (b) Sheet resistance and (b) water contact angle of multilayer CVD-graphene engineered by O_2 plasma and $SOCl_2$ thermal processes.

The authors acknowledge the EU project TWINFUSYON, European Union's Horizon 2020 research and innovation programme under grant agreement No 692034.