P16

Laser Induced Periodic Surface Structures (LIPSS) on Semiconducting Polymers: Poly(3-alkylthiophene)

A. Rodríguez-Rodríguez[1], E. Rebollar[2], M. Soccio[3], T.A. Ezquerra[1], M. Castillejo[2], M.C. García-Gutiérrez[1]

[1]Instituto de Estructura de la Materia, IEM-CSIC. C/ Serrano 121, Madrid 28006, Spain.
[2]Instituto de Química Física Rocasolano, IQFR-CSIC, C/Serrano 119, Madrid 28006, Spain
[3]Dipartamento di Ingegneria Civile, Chimica, Ambientale e dei Materiali, Universitá di Bologna, Via Terracini 28, Bologna 40131, Italy.

alvaro.rodriguez@iem.cfmac.csic.es

Sub-microstructured thin polymer films on solid substrates are used in many technological applications such as optical elements, photonic crystals, high-density magnetic data storage devices, microchip reactors and biosensors among others. Formation of Laser Induced Periodic Surface Structures (LIPSS) with sub-micron periodicities is possible due to the interference between an incoming wave and a surface scattered one[1,2]. The period of LIPPS is close to the laser wavelength. In one hand, the characteristics of LIPSS preparation as compared to those of standard nanolithography methods allows to avoid clean rooms, high vacuum systems or complex stamp fabrication. On the other hand, the available LIPSS morphologies obtained are still limited. Semiconducting polymers like poly(3-alkyl thiophene) (P3HT) have been widely studied as the active layer in organic thin film transistors (OTFT) [3] and organic photovoltaic (OPV) solar cells[4]. In order to improve the interfacial area and thus device efficiency, Nanoimprint Lithography (NIL) has been employed in semiconducting polymers [4]. Here, as an alternative to NIL, we report the formation of LIPSS in P3HT thin films at two different wavelengths: 266 nm and 532 nm. The effect of laser parameters such as number of pulses and fluence will be discussed. By optimization of these parameters polymer gratings with different level of order can be obtained (Fig.1). A better absorption of P3HT at 532 nm than at 266 nm enables the preparation of rather good quality submicron structures with 532 nm period. (Fig.l).

References

[1] E. Rebollar, S. Pérez, J.J. Hernández, I. Martín-Fabiani, D.R. Rueda,T.A. Ezquerra,M.Castillejo, Langmuir, **27,** 5596 (2011)
[2] I. Martin-Fabiani, E. Rebollar, S. Pérez, D.R. Rueda, M.C. García-Gutiérrez, A. Szymczyk, Z. Roslaniec, M. Castillejo,T. A. Ezquerra, Langmuir **28**, 7938 (2012)
[3] A. Facchetti, Chem. Mater., **23 (3),** 733 (2011)
[4] F. Liu, Y. Gu, J. W. Jung,W.H. Jo, T. P. Russell1,, J. Polym. Sci. B: Polym. Phys., **15**, 1018 (2012)

Figures

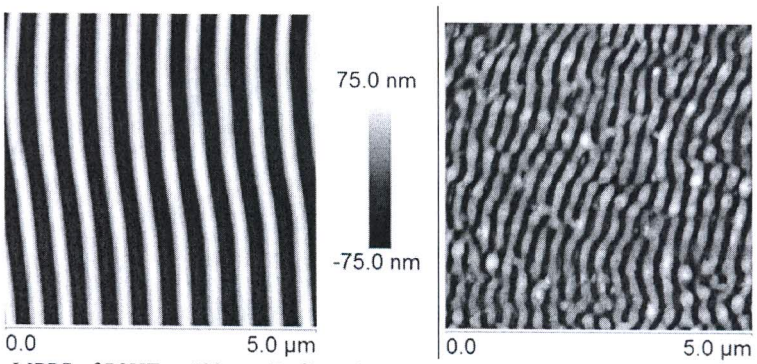

Figure 1: LIPPS of P3HT at 532 nm (Left) and 266 nm (Right) for optimized laser parameters.