

Conjugated Polymers in Ultrathin Film Field-Effect Transistors

Wojciech Pisula,^{1,2} Lukasz Janasz,¹ Mengmeng Li,² Klaus Müllen,² Jacek Ulanski¹

¹Department of Molecular Physics, Lodz University of Technology, Zeromskiego 116, 90-924 Lodz, Poland

²Max Planck Institute for Polymer Research, Ackermannweg 10, 55128 Mainz, Germany

Abstract

Organic field-effect transistors (OFETs) have attracted extensive attention due to their potential applications in flexible, large-area and low-cost electronic devices. The microstructure and molecular orientation relative to the substrate surface have vital influence on device performance.

In this work, we present the effect of the first layers on the structure growth in the bulk film and the thickness dependence on the charge carrier mobility [1,2]. Furthermore, it is shown how the surface roughness of the dielectric is precisely tuned allowing a fine control over solely the interfacial microstructure in the semicrystalline semiconductor polymer film without affecting the morphology in the upper layers [3,4].

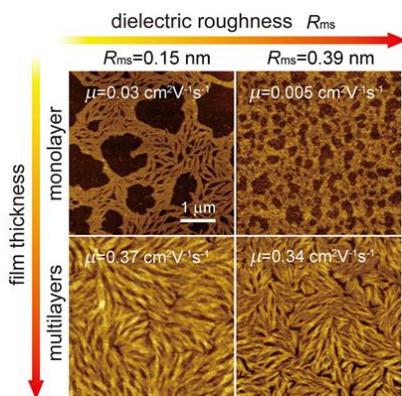


Figure 1. Relation between surface roughness, microstructure and charge carrier transport.

This work was supported by grant 2013/08/M/ST5/00914 of the Polish National Science Centre and by grant Master 9./2014 of the Foundation for Polish Science. We acknowledge the BL09 beamline at DELTA synchrotron in Dortmund for support for GIWAXS measurements.

References

- [1] S. Wang, A. Kiersnowski, W. Pisula, K. Müllen, *J. Am. Chem. Soc.* **134**, 4015, (2012).
- [2] M. Li, C. An, W. Pisula, K. Müllen, *Small* **10**, 1926 (2014).
- [3] M. Li, C. An, T. Marszalek, M. Baumgarten, K. Müllen, W. Pisula, *Adv. Mater.* DOI: 10.1002/adma.201503552 (2016).
- [4] M. Li, T. Marszalek, Y. Zheng, I. Lieberwirth, K. Müllen, W. Pisula, submitted, 2016.