



HAL
open science

Self-assembled monolayers as a smart strategy to arrange electro- and photo-active small organic molecules at surfaces

L. Patrone, V. Malytskyi, V. Gadenne, G. Delafosse, S. Desbief, J.-M. Raimundo, J.J. Simon, B. Jusselme, Dominique Vuillaume

► To cite this version:

L. Patrone, V. Malytskyi, V. Gadenne, G. Delafosse, S. Desbief, et al.. Self-assembled monolayers as a smart strategy to arrange electro- and photo-active small organic molecules at surfaces. Baltic Polymer Symposium 2017, Sep 2017, Tallinn, Estonia. cea-02340937

HAL Id: cea-02340937

<https://cea.hal.science/cea-02340937>

Submitted on 31 Oct 2019

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

SELF-ASSEMBLED MONOLAYERS AS A SMART STRATEGY TO ARRANGE ELECTRO- AND PHOTO-ACTIVE SMALL ORGANIC MOLECULES AT SURFACES

L. Patrone¹, V. Malyskiy^{1,2}, V. Gadenne¹, G. Delafosse¹, S. Desbief¹, J.-M. Raimundo², J.-J. Simon¹, B. Jousset³, D. Vuillaume⁴

¹IM2NP UMR CNRS 7334, Aix-Marseille Université, case 142, 13397 Marseille cedex 20, & ISEN-Toulon, Maison du Numérique et de l'Innovation, Place G. Pompidou, 83000 Toulon, France

²Aix-Marseille Université, CINaM UMR CNRS 7325, case 913, 13288 Marseille cedex 09, France

³Laboratory of Innovation in Surface Chemistry and Nanosciences (LICSEN), DSM/IRAMIS/NIMBE CEA Saclay, F-91191 Gif-sur-Yvette Cedex, France

⁴IEMN - CNRS UMR 8520, Avenue Poincaré, BP 60069, 59652 Villeneuve d'Ascq cedex, France

Molecular self-assembly [1,2] is one of the most promising strategy for giving surface specific properties with a nanoscale control. An important field of application of self-assembled monolayers (SAMs) [2] is the so-called “molecular electronics” within which self-assembly is a very powerful way to obtain the organization at large surface scale of molecules showing particular electro-optical properties.

After the principle of SAM preparation, the motivation of developing SAMs of small organic molecules will be briefly illustrated by some examples of controlling the molecular structuration on silicon surfaces [3, 4]. How organization at the molecular scale acts on electro-optical properties of molecular chromophores will then be discussed focusing on two examples: a structure-electrical properties relationship probed by STM [5] and the SAM of a novel push-pull thiophene-based chromophore [6,7]. For the latter, dense SAM formation of such non-charged chromophore is for the first time clearly demonstrated by spectroscopy (XPS, UV-vis, IR), ellipsometry, scanning probe microscopy (STM, AFM), and electrochemical measurements. Besides, good film quality is highlighted and local I-V characteristics measured by STM and correlated to UPS (filled states) and IPES (empty states) measurements are consistent with the structure of the SAM-organized push-pull molecules standing upright at the surface [6]. This unique combination of properties makes such SAM a system of choice for the foreseen applications like in the field of PV energy conversion [8].

References

- 1) Whitesides G.M., Grzybowski B., Science 2002, 295, 2418-2421
- 2) Ulman A., An introduction to ultrathin organic films, Academic Press: Boston, 1991)
- 3) Desbief S., Patrone L., Goguenheim D., Guérin D., Vuillaume D., Phys. Chem. Chem. Phys. 2011, 13, 2870-2879; Desbief S., Patrone L., Goguenheim D., Guérin D., Vuillaume D., RSC Adv. 2012, 2, 3014-3024; Patrone L., Gadenne V., Desbief S., Langmuir 2010, 26 (22), 17111–17118
- 4) Gadenne V., Porte L., Patrone L., RSC Adv. 2014, 4 (110), 64506-64513
- 5) Lefèvre X., Moggia F., Segut O., Lin Y.-P., Ksari Y., Delafosse G., Smaali K., Guérin D., Derycke V., Vuillaume D., Lenfant S., Patrone L., Jousset B., J. Phys. Chem. C 2015, 119(10), 5703-5713
- 6) Malyskiy V., Simon J.-J., Patrone L., Raimundo J.-M., RSC Adv. 2015, 5, 26308-26315
- 7) Malyskiy V., Gadenne V., Ksari Y., Patrone L., Raimundo J.-M., Tetrahedron 2017, 73, 5738-5744
- 8) Malyskiy V., Simon J.-J., Patrone L., Raimundo J.-M., RSC Adv. 2015, 5, 354-397.