

Self-assembled monolayers based on azobenzene derivatives as MOST systems

^{a,b}E. Piplart, ^{a,b}A. Serez, ^aJ. De Winter, ^cM. Frère, ^bJ. Cornil, ^aP. Gerbaux

^aOrganic Synthesis and Mass Spectrometry Laboratory, Interdisciplinary Center for Mass Spectrometry, University of Mons – UMONS, 23 Place du Parc, B-7000 Mons, Belgium

^bLaboratory for Chemistry of Novel Materials, Center of Innovation and Research in Materials and Polymers, University of Mons – UMONS, 23 Place du Parc, B-7000 Mons, Belgium

^cThermodynamics and Mathematical Physics Unit, University of Mons – UMONS, 31 Boulevard Dolez, B-7000 Mons, Belgium

emma.piplart@umons.ac.be

Azobenzene (AZO) derivatives exhibit a reversible photoisomerization between ground-state trans (E) and metastable cis (Z) forms¹. Pristine AZO and many of its derivatives absorb in the UV range to promote E-to-Z isomerization while the reverse isomerization is generally triggered by visible light for releasing the energy. Densely packed self-assembled monolayers (SAM) of azobenzene derivatives anchored on rigid metal substrates exhibit a high yield of photoisomerization due to cooperative switching effects¹. For grafting on metallic surfaces such as gold or silver, the azobenzene core is typically end-substituted by a thiol group to generate a covalent Au/Ag-S bond upon chemisorption². Interestingly, switches can also be grafted on metal oxides (as demonstrated for ZnO or ITO) by using phosphonic or carboxylic groups as anchoring unit³. A strongly appealing substrate for our project is ITO (Indium-Tin-Oxide) due to its transparency, further allowing for spectroscopic investigations with a bottom illumination, and the high commercial availability of ITO covered glass substrate.

In the present communication, we will present our preliminary results related to the preparation of azobenzene and azoheteroazene chromophores end-terminated by phosphonic groups to allow for their efficient chemisorption on ITO via the formation of covalent O-metal bonds. The determination of the MOST properties of the isolated chromophores are performed before the SAM preparation to assess the impact of phosphonic acid groups on the chromophore photoswitching properties and also to further evaluate the role of the intermolecular interactions within the close-packed assemblies on the MOST properties. The SAM will be further prepared by dip coating the ITO/glass substrate in a solution containing the phosphonic acid-AZO derivatives.

¹ Crivillers et al., PCCP, **2011**, 13, 14302

² Han et al, Chem. Commun., **2010**, 46, 3598

³ Wang et al., ACS Applied Nano Materials, **2019**, 2, 1102