

# Water surface wetting at very first stages of deposition: quantification and interactions

Céline Dablemont<sup>1</sup>, David Houdoux<sup>1</sup>, Justine Houplin<sup>1</sup>, Lionel Amiaud<sup>1</sup>, Anne Lafosse<sup>1</sup>

<sup>1</sup>Institut des Sciences Moléculaires d'Orsay (ISMO), CNRS, Univ. Paris Sud, Université Paris Saclay, F-91405 Orsay, France  
celine.dablemont@u-psud.fr

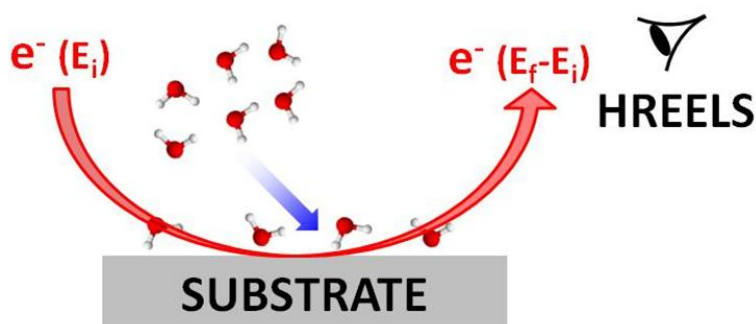
Water / surface interaction, and particularly the wetting layer, play a crucial role in the control of the physical and chemical properties of the structures and interfaces involved in the development of microelectronic components and of chemical and biological sensors. Chemical properties influence, for example, the resistance to the environmental conditions through the control of the corrosion processes. From the physical properties point of view, the presence of water modifies conduction properties of thin layers.

Interfacial and confined water presents specific behaviours in terms of structure and dynamics [1]. We will use these properties of interfacial water to probe, at the molecular level, a substrate at the very first stage of the water adsorption. The method that we have developed is based on the great sensitivity of the OH stretching to its environment [2]. To focus on the interface, this vibration is analyzed by a surface-sensitive spectroscopy: High-Resolution Electron Energy Loss Spectroscopy (HREELS). The proof of concept of this new method has been established on a model hydrophilic organized layer: a Self-Assembled Monolayer (SAM) [3] of 11-

mercaptoundecanoic acid (MUA = HS-(CH<sub>2</sub>)<sub>10</sub>-COOH) [4]. The acid (-COOH) or basic (-COO<sup>-</sup>) terminal functions of these SAMs have been exposed to water at cryogenic temperatures (28 K) under UHV (Fig.). Physical properties have been determined such as the surface-density of the SAM terminal functions. A direct water quantification in the submonolayer regime (10-80% of completion) was achieved.

In addition to physical properties, some chemical properties have been looked for and insights in the nature of water / interface interaction by hydrogen bonding have been described. Finally, the temperature effect on the mobility of the water molecules has been studied by a further annealing at 110 K, showing a complete redistribution of the hydrogen bond map and leading to a clear dewetting of the supporting substrate.

The method described here will be extended, in the near future, to various hydrophobic / hydrophilic surfaces and to substrates of technological interest.



## References:

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