Soutenance de thèse

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Alkali-Halide Thin Films : Growth, Structure and Reactivity upon Electron Irradiation

The ionic salts, NaCl and KCl, are ideal materials with wide electronic band gaps that can be grown in thin films. These thin flims can then act as spacers to electronically decouple organic molecules from a metal substrate so that the molecules retain their intrinsic electronic and optical properties.

In this thesis, the structure and stability of two different thin films of NaCl and KCl, grown on the Ag(001) substrate, were studied using a multi-technique approach with scanning tunneling microscopy and spectroscopy (STM-STS), low energy electron diffraction (LEED), Auger electron spectroscopy (AES), and Grazing incidence fast atom diffraction (GIFAD).

With the plan to obtain high-quality thin films with well-defined properties, it was found that chemical modification of the alkali halide thin films could be induced by electron irradiation using LEED and Auger. It was observed that Cl depletion follows different reaction kinetics, compared to previous studies on thick NaCl films and bulk crystals. The modification of the film proceeds through two processes, which are interpreted as a fast disordering of the film with removal of NaCl from the island edges, and a slow decrease of the structural order in the NaCl with formation of holes due to Cl depletion.

In view of creating molecular island on the thin films, the PTCDA molecules were deposited on the metallic substrate Ag(001) and on the KCl/Ag(001) system. The STM studies reveal a monolayer of PTCDA molecules on Ag(001) with a quadratic unit cell. On KCl/Ag(001), a different arrangement for these molecules was found, whereas on the bare silver, the molecules form islands with random shapes.

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Amphithéâtre du bât 520 (3ème étage)
Université Paris-Sud, 91405 Orsay Cedex

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