

SELF-ASSEMBLED MONOLAYERS OF ORGANOTHIOLS ON ACTIVE METALS

Zineb Mekhalif,¹ Fabrice Laffineur,¹ Fabrice Sinapi,¹
Christophe Pirlot,¹ Tatania Koulminskaya¹ and
Joseph Delhalle¹

¹Facultés Universitaires Notre-Dame de la Paix
Départ. Chimie, LISE, 61 rue de Bruxelles
Namur 5000
Belgium

The spontaneous ordering of adsorbates to form self-assembled monolayers (SAMs) is a phenomenon with great technological potential. Through the deposition of molecules with specific symmetry or functionality, surfaces can be tailored for particular applications such as electrodes, chemical sensors, or corrosion protection.

The presence of a dense organic film at the surface of an oxidizable metal can significantly decrease its corrosion rate. This corrosion inhibition depends more upon the coating's composition and structure and chemical bonds at the polymer/metal interface than upon its thickness.

Our objective is to use self-assembled monolayers to promote the adhesion of polymer films and to improve the ordering of such films by controlling the order of the monolayer-modified metallic surface. For this purpose, alkanethiols with terminal function such as pyrrole or thiophene are appropriate coupling agents. Both the substrate/alkanethiol and the alkanethiol/polymer interfaces have to be taken into account.

In this contribution we will present the preparation and the characterization of self-assembled monolayers (SAMs) formed by chemisorption of alkanethiols on active metals such as nickel, iron and cobalt. The effect of several preparation conditions of the surface upon the monolayer properties will be shown. We will also show how the various steps involved in the surface preparation influence the monolayer properties. We will particularly insist upon the influence of:

- the electrochemical reduction of the native oxide
- the thiol concentration
- the solvent

X-ray Photoelectron Spectroscopy (XPS), cyclic voltammetry, polarisation curves, contact angle measurements and PM-IRRAS were used to characterize the monolayers.

This work has been supported by:

- the Belgian interuniversity attraction pole on "Reduced dimensionality systems" (PAI/IUAP 4/10) initiated by the Belgian office for Scientific, Technical and Cultural Affairs (OSTC)
- the Région Wallonne (SYNATEC convention n°0014526)
- the "Front National de la Recherche Scientifique" (FNRS)