

Deposition of polyelectrolyte multilayer films made from poly(diallyldimethyl ammonium chloride) and poly(4-styrene sulfonate): Influence of the NaCl concentration for films obtained by alternated spraying and alternated dipping

Grégory Mertz^a, Jérôme Bour^a, Valérie Toniazzi^a, David Ruch^a, Vincent Ball^{a,b,*}

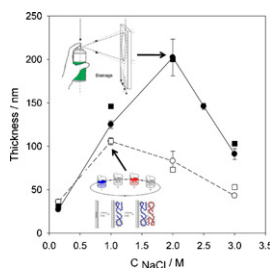
^a Advanced Materials and Structures, Centre de Recherche Public Henri Tudor, 66 rue de Luxembourg, L-4002 Esch-sur-Alzette, Luxembourg

^b Faculté de Chirurgie Dentaire, Université de Strasbourg, 1 Place de l'Hôpital, 67000 Strasbourg, France

HIGHLIGHTS

- Deposition of polyelectrolyte multilayer films either by alternated dipping or alternated spraying.
- Influence of the ionic strength has been changed as an external control parameter.
- Different effects of the ionic strength on the sprayed and on the dipped films.

GRAPHICAL ABSTRACT



ARTICLE INFO

Article history:

Received 1 June 2012

Received in revised form 2 September 2012

Accepted 3 September 2012

Available online 10 September 2012

Keywords:

Alternated spray deposition
Alternated dipping
Polyelectrolyte multilayer films
Ionic strength
Wettability
Composition

ABSTRACT

The deposition of polyelectrolyte multilayer films consists of the sequential adsorption of polycationic and polyanionic species at solid–liquid interfaces. The adsorption process can be performed either by alternated dipping of the substrate to be coated in the polyelectrolyte containing solutions, by alternated spin coating of these solutions or by alternated spraying of them. Different coating technologies can lead to different properties of the obtained coatings even for the same combination of polycations and polyanions. The aim of this article is to show that by playing on the concentration of the supporting electrolyte, NaCl, the films obtained by alternated spraying and alternated dipping grow differently and display different properties, in terms of refractive index, surface morphology, wettability for water and surface composition.

© 2012 Elsevier B.V. All rights reserved.

1. Introduction

The deposition of polyelectrolyte multilayer films (PEM films) [1] at solid–liquid interfaces constitutes a versatile surface functionalization method allowing to fine tune the thickness and properties of the deposited films. Depending on the film growth

regime, the nature of the used polyelectrolytes and the experimental conditions, the obtained coatings can be impermeable or permeable to ions [2,3], can display some specific permselectivity [4], can behave as elastic solids [5] or as soft and swellable membranes [6]. The conditions allowing to control the growth of PEM films, among which the role of the polyelectrolyte's charge density [7], molecular weight [8] and the pH of the solution (in the case of polyelectrolytes carrying weak acidic or weak basic groups) [9] have been deeply investigated and reviewed [10,11]. Most of the PEM films behave as stimuli responsive coatings [12] where the external stimulus can be a change in temperature [13], a change in ionic strength [14], the presence of nanoparticles in the solution in

* Corresponding author at: Advanced Materials and Structures, Centre de Recherche Public Henri Tudor, 66 rue de Luxembourg, L-4002 Esch-sur-Alzette, Luxembourg.

E-mail address: vball@unistra.fr (V. Ball).