Selective erasing of nanoscale Polyelectrolyte films by means of Quaternary Ammonium Surfactants

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Polyelectrolyte Multilayers (PELMs) fabricated by the alternative deposition of oppositely charged polyelectrolytes (LBL technique) on charged substrates, have received considerable attention during the past decade due to their ease of preparation, their tuneable properties at the nanoscale, and the possibility of assembling some other functional molecules such as nanoparticles, lipidic layers or proteins inside or on top of the multilayer for the templation of hybrid materials. These features make the LBL technique a unique tool for non covalent surface modifications.
PELMs are very stable films and can be employed to protect surfaces , to provide specific recognition functions or even to fabricate polyelectrolyte capsules.
There are, however, situations where it becomes necessary to remove the PELM under mild conditions to deprotect a surface or to liberate encapsulated material for example. In this work we want to show that is possible to selectively strip off PELMs in presence of quaternary ammonium surfactants at low concentration.
The response of PEMLs composed of Polydiallyl Dimethyl Ammonium Chloride **(**PDADMAC)/ Poly Sodium Styrene Sulfonate (PSS) and Poly allyl hydrochloride (PAH)/PSS exposed to Tetradecyl Trimethyl Ammonium Bromide (TdTmAB), an ionic surfactant based on a quaternary amine, has been characterized at concentrations below and over the Critical Micellar Concentration of the surfactant. The Quartz Crystal Microbalance with Dissipation (QCMD) technique, Atomic Force Microscopy, Contact Angle, and the recently developed QCMD/Ellipsometry combined technique have been applied for the characterization of the interaction of the surfactants with the PELMs.
While for PAH PSS multilayer the interaction of the films with TdTmAB results in the binding of the surfactant or micels to the PELMs; for PDADMAC PSS PELMs the interaction of the surfactant with the results in the complete removal of the PELMs.