ZWITTERIONIC POLYMER SURFACES BASED ON PHOSPHORYLCHOLINE: SWELLING AND BIOMOLECULE INTERACTION

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Zwitterionic polymers with positively and negatively charged molecular groups along the chains are showing excellent biocompatibility and are promising for applications in implant medicines, biosensors, or drug release [1]. Of special interest are coatings based on the zwitterionic phospholipid polymer poly (2-methacryloyloxyethyl phosphorylcholine) (PMPC) due to their biomimetic resemblance of phospholipid bilayers in biomembranes [2].

We prepared MPC – containing polymer layers based on the statistical copolymer MPC-*co*-GMA (Fig. 1a) with different layer thicknesses and analyzed their swelling behavior, protein resistance and phospholipid interaction by in-situ VIS-ellipsometry. We found good resistance to the adsorption of bovine serum albumin (BSA), the most abundant protein in the blood plasma, and considerable adsorption of the phospholipid DPPC (lipid for cell membrane models) (Fig. 1b).

Additionally, we mixed the MPC with the pH-sensitive polymer poly acrylic acid (PAA) aiming at stimuli-responsive blend layers with anti-fouling properties.

Ellipsometric investigations were combined with surface characterization by X-ray photoelectron spectroscopy (XPS), atomic force microscopy (AFM) and contact angle measurements, as well as quartz crystal microbalance (QCMD) analysis.

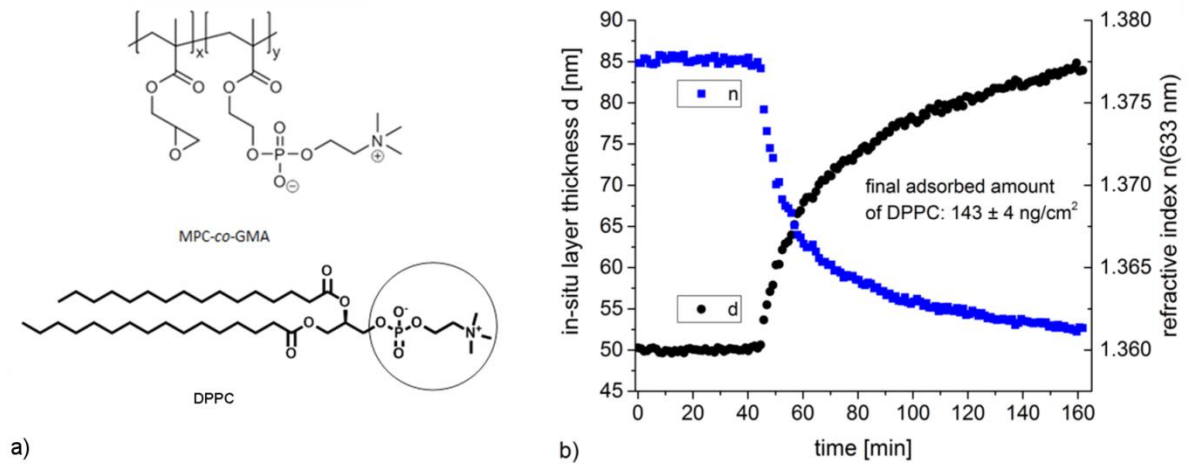

Fig. 1: a) Chemical structures of MPC-*co*-GMA (top) and 1,2-dipalmitoyl-*sn*-glycero-3-phosphocholine (DPPC) (bottom), b) in-situ layer thickness and refractive index at λ=633 nm for DPPC adsorption ($c^{DPPC}_{in\text{-}solution}$ = 0.25 mg/ml) to a MPC-*co*-GMA layer (dry thickness: 15 nm) in 10 mM sodium phosphate buffer solution at pH 5.8 with 1 mM $CaCl_2$.

Keywords: phosphorylcholine; in-situ VIS ellipsometry; protein adsorption

References

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