

Investigation of hybrid bi-layer model coating as controlled drug release system

Mátyás Dabóczi, Márta Kabai-Faix, Emőke Albert, Zoltán Hórvölgyi

*Centre for Colloid Chemistry, Budapest University of Technology and Economics,
Budapest, Hungary, 1111 Budafoki út 6-8.
daboczmatyas@gmail.com*

Controlled drug release systems are in the scientific spotlight in the last decades thanks to the promising properties of these systems which may allow to an effective and localized drug concentration to be reached for a long time in the body.

In this study hybrid bi-layer coatings were investigated as models for controlled drug release. The examined system contained a porous silica thin layer on glass substrate and a second, chitosan biopolymer layer on it. Both layers were formed by the dip-coating technique. Rhodamine 6G dye was used as model drug. The dye was incubated into the porous silica from its aqueous solution prior to the polymer layer deposition. The chitosan layer was cross-linked ionically by sodium-tripolyphosphate and covalently by glutaraldehyde.

UV-Vis spectroscopy method was used to determine the refractive index and/or thickness of layers by analyzing the transmittance spectra in terms of optical models. Drug release examinations were performed in acidic (pH = 3), basic (pH = 11) and in phosphate buffer (pH = 7.4) solutions. The kinetics of drug release of bilayers was investigated using ionically, covalently and non-cross-linked chitosan layers.

For the better understanding of the release properties contact angle measurements were performed. The kinetics of contact angles was determined on the aforementioned samples.

Additionally, *in situ* spectroscopic ellipsometry measurements were accomplished in flow-cell with buffer solutions for the determination of swelling properties of chitosan coatings.

The results may contribute to a better understanding of material transport processes across the hybrid chitosan-silica coatings.

Acknowledgement

The authors would like to express their gratitude to Norbert Nagy and Emil Agócs (MTA TTK MFA Photonics Department) for their assistance in spectroscopic ellipsometry measurements.

Emőke Albert's research work was supported by the European Union and the State of Hungary, co-financed by the European Social Fund in the framework of TÁMOP-4.2.4.A/ 2-11/1-2012-0001 'National Excellence Program'. The financial support of the New Széchenyi Plan (TÁMOP-4.2.1/B-09/1/KMR-2010-0002) and of the National Development Agency (Hungarian-French Bilateral Co-operation, PHONOSEL, TÉT_11-2-2012-0008 and Hungarian-Romanian Bilateral Co-operation, SOLGELCOR, TÉT_12_RO-1-2013-0011) is gratefully acknowledged.