11th International Conference
on Advanced Materials

Rio de Janeiro Brazil
September 20 - 25

ICAM2009

Biomimetic Surfaces Containing Phospholipid and Metallophthalocyanines: Application as Chemical Modified Electrodes

E.G.R. Fernandes(1), C.J.L. Constantino(2), M.L. Rodríguez-Méndez(3), J.A. De Saja Saez(4), V. Zucolotto(1)*

(1) Grupo de Biofísica, Instituto de Física de São Carlos, USP - São Carlos. email: zuco@ifsc.usp.br.
(2) DFQB, Faculdade de Ciências e Tecnologia, UNESP, 19060-900 Presidente Prudente, SP, Brazil.
(3) Inorganic Chemistry Department, E.T.S. Ingenieros Industriales, University of Valladolid, 47011 Valladolid, Spain.
(4) Condensed Matter Physics Department, Faculty of Science, University of Valladolid, 47011 Valladolid, Spain.

Abstract –Phospholipids are widely used as mimetic systems for studies involving biological membranes. The zwitterionic DPPC phospholipid and the anionic nickel tetrasulfonated phthalocyanine (NiTsPc) were applied in the fabrication of ultrathin films using the Layer-by-Layer (LbL) methodology. The final goal is to produce chemical modified surfaces for applications in sensing.

The lipid fraction of the biological membranes is mainly composed by phospholipids with different chain length and ionic character. Therefore, phospholipids are widely used as mimetic systems of biological membranes in studies based on the interactions between immobilized biomolecules and drugs/proteins that might be incorporated into artificial membranes. Consequently, the development of techniques that allow immobilizing phospholipids onto solid substrates are desirable. Phthalocyanines are well known for their high thermal and chemical stability, in addition, they exhibit electroactivity, semiconductivity, and photoconductivity. Based on a recent paper on LbL films containing multilayers of polyelectrolyte/phospholipid [1], we demonstrate here the possibility of growing LbL films containing PAH/(DPPC+NiTsPc).

NiTsPc and poly(allylamine hydrochloride) (PAH) were purchase from Aldrich and used without purification. The zwitterionic DPPC [L-R-1,2-dipalmitoyl-*sn*-3-glycero-phosphatidylcholine, purity >99%] phospholipid was purchased from Avanti Polar Lipids Inc. All other chemical reagents were of analytical grade. The $[PAH/(NiTsPc+DPPC)]_n$ LbL films containing up to 16 bilayers were deposited on hydrophilic quartz substrates for adsorption and kinetic studies. The multilayer adsorption process was carried out by immersing the substrates in the cationic PAH solution for 3 minutes (0.8 mg/mL), following immersion into ultrapure water for 3 s. In a second step, the substrates were immersed for 3 minutes in an aqueous solution (5.0 mL) of DPPC (0.73 mg/mL) where it was added 500 µL of an aqueous solution of NiTsPc (0.5 mg/mL) and then washed as described above, forming the first bilayer. UV-Vis spectra from Figure 1 shows the growth of the PAH/(NiTsPc+DPPC) LbL films. The linear dependence of the absorbance at 610 nm on the number of deposited bilayers is shown in Figure 2. The films produced here as now being used as platforms for tyrosinase immobilization and detection of polyphenols will be also presented in the paper.

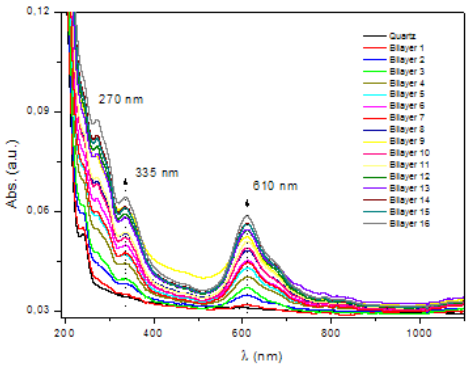

Figure 1: UV-Vis spectra for the PAH/(NiTsPc+DPPC) LbL films with different number of bilayers.

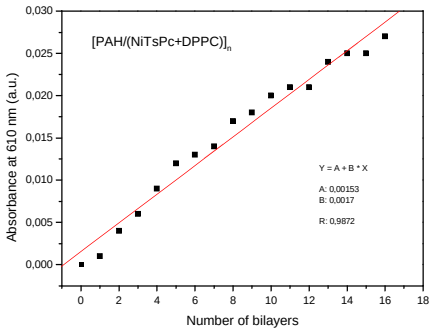

Figure 2: Absorbance at 610 nm *vs* number of bilayers.

Acknowledgements: FAPESP and CAPES (process 118/06) from Brazil and MICINN (PHB2005-0057-PC) from Spain.

Reference:

[1] P. H. B. Aoki, D. Volpati, A. Riul, Jr., W. Caetano and C. J. L. Constantino, Langmuir 25 (2009) 2331-2338.