11th International Conference
on Advanced Materials

Rio de Janeiro Brazil
September 20 - 25

ICAM2009

Spatial Organization of Peptide Nanotubes for Electrochemical Devices

Cipriano, T. C.;* Silva, R. F.; Takahashi, P. M.; Oliveira Jr, V. X. and Alves, W. A.

thiago.cipriano@ufabc.edu.br, rondesf@gmail.com

Centro de Ciência Naturais e Humanas, Universidade Federal do ABC, Santo André, São Paulo.

Abstract – Peptide Nanomaterials have Tremendous potential for application in biomedicine, biotechnology and nanotechnology. With the objective of nanotubes showed that peptide (PNTs) can serve the part of an electrochemical biosensor platform was to design and characterization of Ultrathin Multilayer films using the sequential layer-by-layer (LBL) deposition of peptide nanostructures and polycations.

Peptide nanomaterials have attracted great interest from the scientific community for its tremendous potential for application in biomedicine, biotechnology and nanotechnology.[1] These nanomaterials are eobtained by peptides self-assembly and results in supramolecular structures that can be interconnected through non-covalent intermolecular interactions such as hydrogen bonds, π-π stacking, electrostatic and van der Waals interactions. In this case, diverse morphologies ranging from nanotubes to nanoribbons and nanowires, can be obtained by changing the solvent polarity.[2] Therefore, so far, systematic investigations on the morphological variation of peptide-assembly is necessary.[2] Besides, the results of recent studies from our group have showed that peptide nanotubes (PNTs) can serve as part of an electrochemical biosensor plataform. The aim of the present work was to design and characterization of multilayer ultrathin films using the sequential Layer-by-Layer (LBL) deposition of peptide nanostructures and polycations. Selecting horseradish peroxidase (HRP), as a model enzyme, was used to construct the bionanomultilayer of $(PNTs/HRP)_n$ via LBL assembly. UV/Vis spectra, scanning electron microscopy (SEM), FTIR spectra and atomic force microscopy (AFM) reveal the uniform assembly process and the homogeneity of the bionanomultilayer.

Figure 1 shows topography AFM and SEM images of the first deposited layer of peptide nanotubes on a PDDA-coated cationic surface in different concentrations and pHs. The concentrations used in this study were 1.5 mg/ml, 10 mg/ml, 20 mg/ml and pH: 3.0, 7.0 and 12.0. The nanotubes were obtained from a solution of L-Phe···L-Phe in 1,1,1,3,3,3-hexafluor-2-propanol. Upon increasing the peptide concentration, these peptides form a hierarchy structure such as fibrils, which comprise a class of solf-solid-like nanostructure materials. In addition, the peptides self-assembly can be influenced upon changing the pH of the solution. The charge introduced into these peptides also facilitates a coulombic attraction/repulsion between oppositely charged peptides and leads to spontaneous self-assembly/disassembly of fibrillar structures.

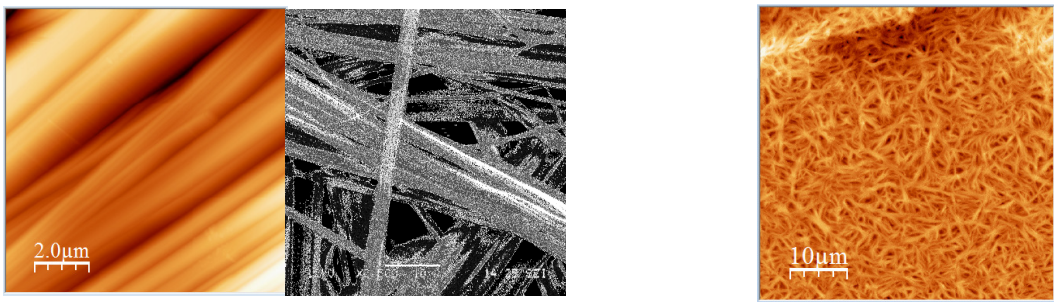

Figure 1- AFM and SEM images showing ultrastructure stability of the diphenylalanine nanotubes prepared in solution of pH 7 and 12, respectively.

References

[1] Menzenski, M. Z.; Banerjee, I. A. *New. J. Chem.* **2007**, *31*, 1674.
[2] Han, T. H.; Park, J. S.; Oh, J. K.; Kim, S. O. *J. Nanosci. Nanotechnol.* **2008**, *8*, 5547.

Acknowledgment

FAPESP, CNPq, CAPES, INCT em Bioanalítica