Antibacterial effect of biomineralizated diamond-like carbon containing titanium dioxide nanoparticles

Felipe Souza Lopes[1], Jonatas Rafael Oliveira[2], Luciane Dias Oliveira[2], Juliana Milani[1], Natália Marassi Martinelli[1], Vladimir Jesus Trava-Airoldi[3], Anderson Oliveira Lobo[1], Fernanda Roberta Marciano[1]

[1]Universidade do Vale do Paraíba, [2]Universidade Estadual Paulista, [3]Instituto Nacional de Pesquisas Espaciais

e-mail: nutricao-lopes@bol.com.br

Diamond-like carbon (DLC) films are commonly used for implanted medical interest

due physical, chemical characteristics, showing good interactions with biological

environment. However, these properties can be significantly enhanced when

nanoparticles are present in the film structure. The deposition of hydroxyapatite (HAp)

on DLC surface has been studied in order to improve bioactivity, aiming this new

composite applicability in bone-regenerative medicine. The goal of this work is study

the antibacterial effect of TiO2-DLC films after the crystal apatite deposition through a

biomimetic precipitation process. The films were growth on 316 stainless steel

substrates using plasma enhanced chemical vapor deposition. The biomineralization

process was performed using simulated body fluid on DLC and TiO2-DLC films.

Scanning electron microscopy, energy dispersive X-ray, X-ray diffraction and Raman

scattering spectroscopy characterized the samples. The antibacterial activity of

the

biomineralized films were evaluated by bacterial eradication tests with Pseudomonas

aeruginosa and Staphylococcus aureus. The results indicate that an increase

concentration of nanoparticles in the film do not directly influence the antibacterial

effect. However, it cause a change in the size of carbonated apatite crystals and in its

wettability. This work shows biomineralized TiO2-DLC films can be useful to produce

coatings with antibacterial properties for biomedical industry.