BIOCOMPATIBILITY *IN VITRO* STUDIES OF RAW VERTICALLY-ALIGNED MULTI-WALLED CARBON NANOTUBES FUCTIONALIZATED BY OXYGEN PLASMA

A. O. Lobo[1,2], M. A. F. Corat[3], E. F. Antunes[1,2], C. Pacheco- Soares[4] and E. J. Corat[1,2]

[1] *Instituto Tecnológico de Aeronáutica/CTA, São José dos Campos/SP, CEP: 12228-900, Brazil.*
[2] *Instituto Nacional de Pesquisas Espaciais, CP 515, São José dos Campos/SP, CEP: 12.245-970, Brazil.*
[3] *CEMIB, Universidade Estadual de Campinas (UNICAMP), Campinas/SP, CEP:13083-877, Brazil.*
[4] *Universidade do Vale do Paraíba, São José dos Campos/SP, CEP: 12227-010, Brazil.*

1. Introduction

The very important role of nanotechnology in the biological scene is becoming clear in the last few years with several papers studying the interaction of vertically-aligned carbon nanotubes (VACNT) films with cell culture for biomaterials application [1-3]. In the classes of nanostructured materials the VACNT have great potential for biomedical applications, due to their unique properties such as high electrical conductivity, high chemical stability, high mechanical strength and facilitation of functional groups incorporation for scaffolds production. But, the raw VACNT arrays exhibit super-hydrophobic behavior [4], show difficulty in initial times (6-24 hrs) in cellular adhesion, essential for proliferation and differentiation

2. Experimental

The VACNT films were obtained by microwave plasma process using Fe and Ni catalysts. After VACNT growth they were submitted to a discharge change oxygen plasma treatment, during 2 min, at 400 V and 80 mTorr. From this treatment the VACNT converted from superhydrophobic to super hydrophilic. The cells cultures used were L-929 and embryos GFP mouse fibroblasts cells and SaOS-2 human osteoblasts cells. The *in vitro* cytocompatibility tests used were: 1) cytotoxicity, using MTT colorimetric assay to study cell viability, 2) LDH assay based on cellular membrane integrity and 3) cellular adhesion to evaluate the cellular behavior by scanning electron microscopy (SEM) and Fluorescence Microscopy (FM). Characterizations of VACNT super-hydrophilic surfaces were evaluated by contact angle (CA), Raman spectroscopy and X-Ray Photoelectron Spectroscopy (XPS).

3. Results and Discussions

The Figure 1 shows the high viability and cellular proliferation of the cells on VACNT. Significant differences on spreading and cell behavior (FEG-SEM, FM) are observed on VACNT super-hydrophilic surfaces (Fig. 2) in initial times (6-24 hours), increasing the number of cytoplasmatic projection in all directions and the number of adhesion focal sites, comparated with raw VACNT surfaces. The superhydrophilicity is fundamental to accelerate the cell attachment and proliferation. Consequently, cell monelayers can be formed faster than on hydrophobic ones. The results shows by vertically-aligned MWCNT are very important because such efficient spreading, cell growth and cell proliferation for development the nanobiomaterials apply to tissue regeneration.

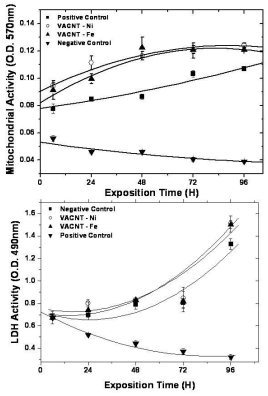

Fig. 1. *MTT) and LDH activity (LDH total) the VACNT, obtained the Ni and Fe catalisty, after 96 h the exposition.*

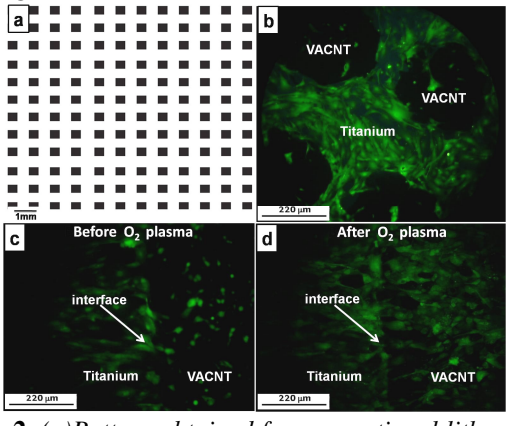

Fig. 2. *(a)Pattern obtained for conventional lithography to deposite VACNT arrays(b,c e d) Image of FM of MEF-GFP cells on VACNT arrays before plasma treatment, incubated by 48h.*

4. References

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*Corresponding author: anderson@las.inpe.br