

10th International Conference on Nanosciences & Nanotechnologies (NN13)

9 - 12 July 2013, Porto Palace Conference Centre & Hotel
Thessaloniki, Greece



NN13

ABSTRACT BOOK

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PLENARY SPEAKERS (common with ISFOE13)

Andrea C. Ferrari, University of Cambridge, UK
George Hadziioannou, LCPO, CNRS, France
Buddy Ratner, UWEB, USA

KEYNOTE SPEAKERS

Ravi P. Silva, University of Surrey, UK
Ioannis Misirlis, University of Patras, Greece
Efthimios Kaxiras, Harvard University, USA
George Malliaras, EMSE, France
Rachel Segalman, University of California, USA
Paul W. M. Blom, Max Planck Inst. for Polymer Research, Germany
Raffaele Mezzenga, ETH-Zurich, Switzerland
Christian Collette, ARKEMA, France
Mark Geoghegan, University of Sheffield, UK
Ludwig Leibler, ESPCI ParisTech, France

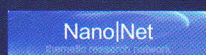
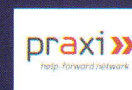
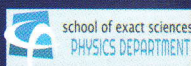
NANOTEXNOLOGY 2013

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Biodegradable nanoporous polymeric multi-layered films for drug delivery

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Controlled drug delivery systems have become an area of intense research. Biodegradable polymers are widely used as coatings in implants for sustained drug release.

In this study, biodegradable nanoporous polymeric coatings have been developed by spin coating in the form of a single layer and multi layers. Particularly the biodegradable nanoporous platform was synthesized by a) a blend of poly-ε-caprolactone (PCL) and poly (DL-lactide-co-glycolide) (PLGA_{75:25}), b) PCL and PLGA_{75:25}, PLGA_{65:35} with different degradation rates in a triple-layer configuration, c) PCL, PLGA_{75:25}, PLGA_{65:35} and Poly(vinyl) alcohol (PVA) in a quatern-layer configuration. Dipyridamole and Dexamethasone were used as models for drug release kinetics. Dipyridamole, an adenosine reuptake platelet inhibitor, was loaded in the outer and middle layer of the platform in different concentrations (DPM:PLGA: 1:3 and 1:2 w/w), whereas Dexamethasone, a steroidal anti-inflammatory drug, was loaded in the outer layer of the platform in different concentrations (DXM:PLGA: 1:3 and 1:2 w/w). Drug release kinetics were studied in vitro after the platform incubation in PBS at 37°C over 70 days. Atomic Force Microscopy (AFM) & Spectroscopic Ellipsometry (SE) were applied for the morphological, structural and optical characterization of the samples.

It was found that the porosity and the drug release rate were both dependent on the position (i.e., outer or inner layer) as well as the concentration of each drug. These results indicate that these platforms can be used to achieve alterations in the porosity and the drug release rate, according to the requirements of each application. Hence, the above systems have the potential to be applied as coatings with sustained drug release profiles, for biomedical implants

Silica Nanoparticles as Carriers of Ascorbic Acid Particles

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Silica (SiO₂) nanoparticles are known for their ability to attach different types of other particles and carry them to target destinations. Application of commercial SiO₂ nanoparticles as a carrier of ascorbic acid particles was studied. The size of SiO₂ nanoparticles was 10-20 nm. Ascorbic acid (AA) plays an important role in physiological processes in plants: growth, metabolism and adaptation (Y. Zhang, 2013). The role of SiO₂ nanoparticles was to attach lots of AA particles and thus ensure greater consumption of AA by a plant during its growth. Adherence of AA particles to SiO₂ nanoparticles was studied using spectrophotometry measurements. Comparison of the experimentally measured and theoretically calculated optical absorbance spectra showed that AA + SiO₂ complexes were formed when SiO₂ and AA particles were mixed in triple distilled water. The complexes remained stable at least during 24 hours. Influence of the AA + SiO₂ complexes on flax plant ('Blue di Riga') callus cell cultures was studied. Callus cultures are unorganized plant cells that grow and divide, forming clusters of cells. Callus cultures are widely used in research related to the study of the influence of various substances on the cells, as the impact of these substances on callus cells can be observed easily. Number of regeneration areas was counted after 3, 4 and 5 weeks of callus culture cultivation in the growth medium. Regeneration areas are accumulation of cells where plant regeneration occurs later. Student's t-test showed statistically significant difference between the control groups and the groups cultivated using AA + SiO₂ complexes.

Results suggest that use of SiO₂ nanoparticles in combination with ascorbic acid particles improve plant vegetation by increasing number of regeneration areas of callus tissue and increasing callus size