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Soft transfer pulsed laser technologies for applications in regenerative medicine

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Recent results in organic/inorganic composite nanostructured layers synthesized by MAPLE and LDW are reviewed. The optimum deposition regime was reached based upon the results of investigations by SEM, TEM, SAED, XTEM, AFM, XRD, XPS or FTIR methods. Biocompatibility, bioactivity and biodegradation were assessed by dedicated in-vitro tests. Urease immobilized by MAPLE in form of thin films was shown to preserve its activity in breaking down and diagnose of urea content in blood. The application of MAPLE was extended to the transfer and immobilization of IgG molecules. We studied the effect of the lipid addition in the initial solution upon the protein thin films adhesion to substrate. We showed that the composite PMMA-bioglass films efficiently protects metal implants against the action of human fluids. The MAPLE obtained nanocomposites Ag:HA-organosolv lignin proved noncytotoxic supporting the normal development and promoting the proliferation of the adhered human mesenchymal cells. The lignin addition potentiated the anti-microbial activity of HA doped with silver ions against either bacterial or fungal biofilms. Meso tetraphenylporphyrin clean and liquid-free micropatterns on Si substrates were fabricated by LDW. The propulsor metal film thickness was found to be a key parameter which determines the laser fluence range allowing the clean transfer, predominant mechanism of the blister formation and laser-induced heating of the transferred material. We conclude that the thin films prepared by MAPLE and LDW techniques were identical in chemical composition, structure, morphology and most likely functionality resembling the base material as proved by physical-chemical characterization and *in vitro* assays.

Biography

Ion N Mihailescu is Senior Scientific Researcher 1st degree in LSPI-INFLPR and Professor and PhD supervisor at Physics Department, University of Bucharest. His current fields are biophysics and biomedicine; plasma and laser physics and theory and current research interests go to surface studies with lasers; surface processing; deposition and modification of thin solid structures by high intensity laser irradiation and biomaterials. He received the 1994 Galileo Galilei Award of the International Commission for Optics (ICO) "for outstanding contributions to the field of optics". He authored more than 400 publications, Hirsch index 27, total citations over 3000.

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