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General Objectives: Having a platform to stimulate cell growth and guidance for tissue regeneration is essential in various biomedical applications and in tissue engineering, and involves the need to obtain two and three-dimensional structures, specifically localized micro-and nano-textured surfaces of hybrid or composite materials.
This project is mainly aimed at obtaining hybrid micro and nano complex structured polymer supports used as platforms for oriented cell growth by using laser based methods (matrix assisted laser evaporation-MAPLE, Laser Induced Forward Transfer - and laser direct irradiation / material processing).
A complementary direction followed in this project is to evaluate the effect of texturing and layout of two and three-dimensional "architecture" type on cells adhesion, growth, inhibition and on other cellular interactions in vitro.

Results

1. Experimental set-up were adapted in the PPAM group for polymer thin films deposition (matrix assisted pulsed laser evaporation -MAPLE) and the transfer of "structures" in liquid or solid phase .
2. Thin films were obtained (PEG, chitosan, collagen and chitosan or collagen incorporated PEG) as monolayer or multilayer by MAPLE and spin-coating, and were characterized morphologically and structurally (atomic force microscopy - AFM, electron microscopy -SEM, Fourier transform infrared spectroscopy - FTIR).
3. Tests were carried out to change the architecture and surface physicochemical properties by direct irradiation with a laser beam.
4. The parameters were optimized to obtain thin films (monolayer, multilayer) by MAPLE and spin-coating for each component.
5. We demonstrated that MAPLE technique to be suitable for achieving controlled multilayer structures, especially when it is necessary to use the same solvent (eg acetic acid solution for chitosan and collagen, and toluene or chloroform for PEG , PEO).
6. We obtained polymer structures by LIFT in a controlled manner, both in liquid and solid phase. Biological assays were performed in vitro, which was observed evolution

type fibroblast cell morphology and OLN on films and structures obtained. LIFT have demonstrated that the method can be used to transfer pixel polymer with different morphologies onto soft flexible substrates for different cell adhesion studies.

7. We studied the limits but also the versatility of the method in femtosecond laser irradiation of polymer surfaces CS for getting 2D and 3D structures of "bubble", "sponge" and "Ditches" . Oligodendrocytes and fibroblast cells cultured on irradiated surface showed that early growth of the cells was determined by specific surface micro-topography of CS, thus representing a possible use for mobile cell platforms.

8. Contacts and collaborations have been established with the Institute of Biochemistry, resulting in a poster presentation at the International Conference BioIron Society Program, 2 articles and further collaboration within a partnership project started in 2014.

9. Dissemination activities: three invited presentations, an oral presentation / seminar, 20 posters presented at international conferences (EMRs 2013, Strasbourg, France; International BioIron Society Program, University College London, in 2013 and HPLA-BEP, Santa Fe) and national (Modern Laser Applications - INDLAS 2013, Bran, Romania, Bucharest ROMOPTO 2012, ISCP Sinaia 2013 ISCP Orastie 2014). five articles published in ISI journals (Romanian Reports in Physics (IF 0.5), Applied Surface Science (2.54), Biomedical Microdevices (IF 2.718)).

10. One international prize for best poster (granted to Rusen Laurentiu) at EMRS, in Strasbourg, France, 2013 for the work: Stimuli responsive functional polymeric thin films obtained by matrix assisted pulsed laser evaporation (MAPLE) for cell detachment studies

11. Some of the results obtained in 2011-2014 were included in the PhD thesis of Laurentiu Rusen, defended in 12 September, 2014 and which was excellent rated (in collaboration with the Department of Optics, Faculty of Physics, University of Bucharest).