

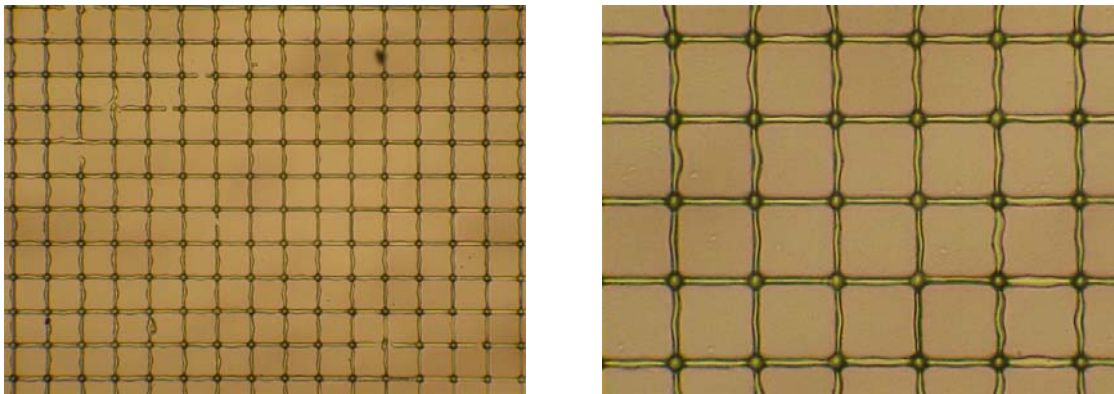
### Stage 3

There were synthesized both a diacrylate and a dimethacrylate that contain polydimethylsiloxane segments of molecular weight 5600, whose structure was confirmed by spectral analysis. In tandem it was proposed to use triacrylate monomers that were specially functionalized, with the purpose to improve the properties of the hybrid materials that were obtained by fonic photo polymerization. From this class there were prepared and characterized two monomers, whose behaviour to UV photopolymerization is studied.

A femtosecond laser emitting at 775 nm, with pulse duration of 200 fsec and a repetition of 2 kHz was used for 2 photons polymerization experiments. The investigated gel (for example ormosil) is placed on a motion stage that can be moved on x, y, z axis. Stepper motors can move a sample on 4x4x4 mm, with a step of 50 nm and a precision of 500 nm. An additional piezoelectric system can be used for sharper movements, 20x20x20 nm and a precision of 5 nm.

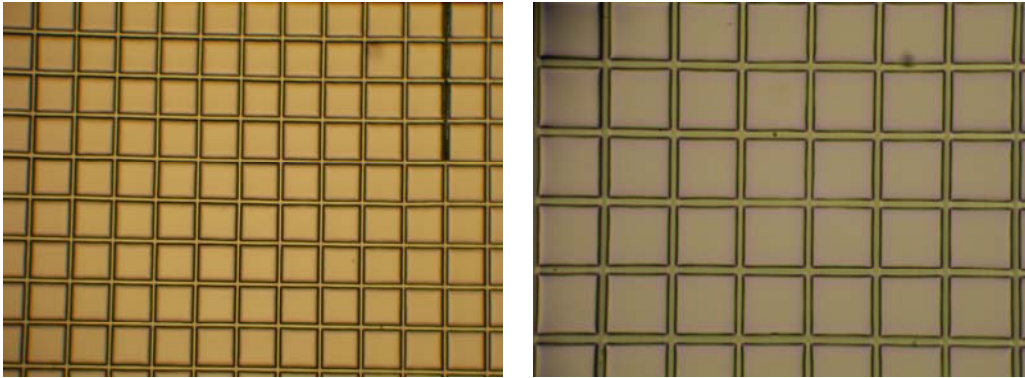
During this stage, SIM 1 and SIM 4 were polymerized with 2 photons, bidimensional structures being formed. Three types of initiators were used and the irradiation parameters were varied (the laser power and the sample velocity in front of the laser beam).

Examples of polymerized structures:



Optical microscopy images on a SIM 1 sample of 50x50 lines, obtained with 2PP. The sample velocity was 1 mm/s. The spacing between the lines is 50 microns and the initiator was

IRGACURE 369



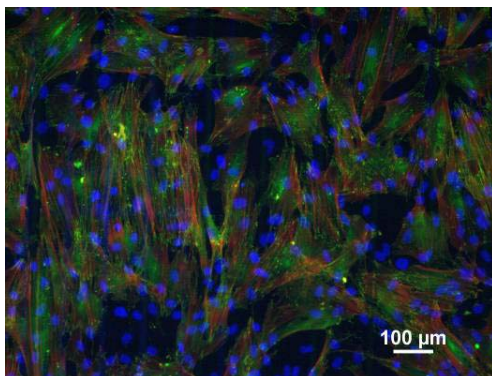
Images on a 20x20 lines SIM 4 sample. The laser power is 5 mW and the sample velocity 0.5 mm/s. The spacing between the lines is 100 microns and the initiator was benzophenone.

Thermal degradation has been investigated both for the ormosil types monomers synthesized By P1-ICMPP and for the polymers obtained at CO-INFLPR by laser irradiation. The polymerization conditions were varied (initiator, laser energy, polymerizing time) in order to investigate the result of the ormosils photopolymerization.

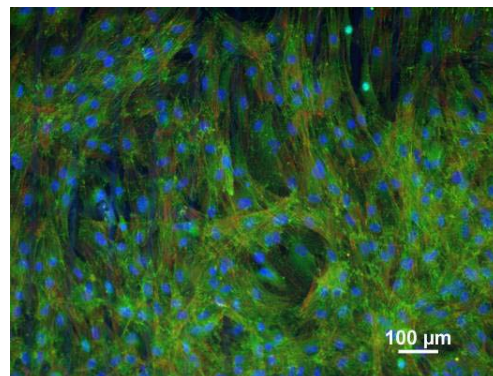
During this stage there were carried out experiments for growing mesenchymal stem cells and fibroblasts on polymeric scaffolds in order to obtain bone and dermal graphs. There were studied the proliferation of the cells grown on these scaffolds as well as the morphology and cell adhesion.

Human mesenchymal stem cells grown on a SIM1+IRG 369 grid

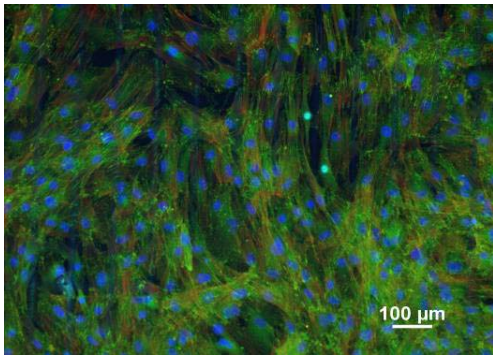
a



b



d

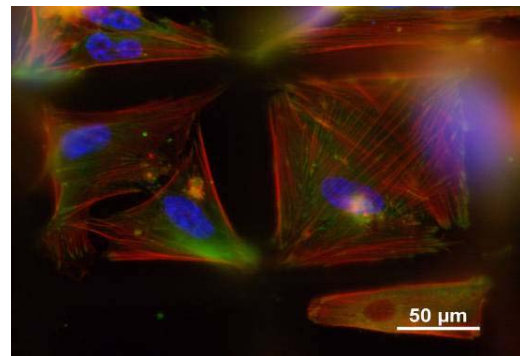
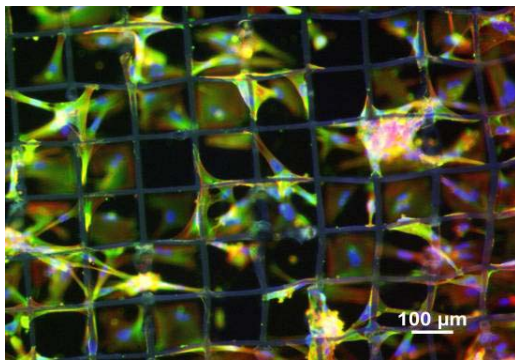


The mesenchymal stem cells succeed to grow with high density on SIM 1+ IRG 369 structure, and a dense tissue is formed on a, b, d elements.

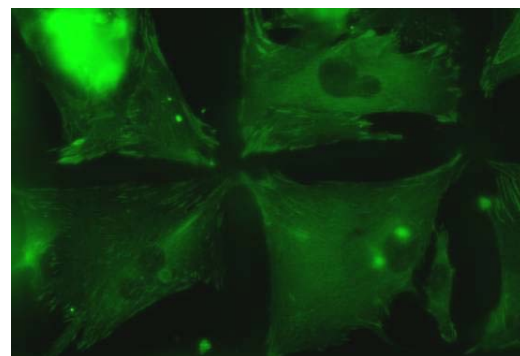
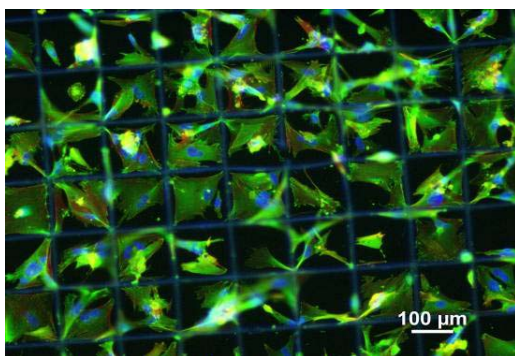
Epithelial cells MRC-5

A1-SIM1+benzophenone

1



2



On the sample SIM 1+benzophenone, the cells grow in the polymer squeres. These structures are optimal for further studies in biomedical applications.

The polymer with the structure: N,N'-(metacriloyloxyetil trietoxi sililpropil carbamoiloxihexil)-urea has been also investigated with physico-chemical analysis on aqueous extract and with DSC thermal analysis.