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Influence of Crystallinity and Selected Mechanical Properties on Cellular Response

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Cells sense subtract stiffness, elasticity and transduce that information into morphological changes and lineage specification. Polymer molecular order and mechanical properties, especially stiffness and elasticity indicate influence on cellular response during in- vitro study [e.g. Bershadskye et al 2013].

The aim of proposed presentation is to evaluate the effect of tailored crystallinity and mechanical properties of one- and bicomponent polymer films in terms of cells morphology and proliferation without changing other parameters.

Polycaprolactone (PCL) and Gelatin (Ge) were used. As a solvents: Hexafluoroisopropanole (H), Acetic Acid (AA) were chosen. Two methods of foil preparation were analysed: forming from melt (onecomponent), forming from solution (one- and bicomponent).In both methods, the degree of crystallinity was modified mainly by the different type of PCL molecular weight, solvent type and/or annealing. Films were analysed using polarizing-interference microscopy allowing characterization of spherulities morphology. Degree of crystallinity was analysed by differential scanning calorimetry. Foils topography was analysed by atomic force microscopy, selected mechanical properties and hydrophilicity (contact angle) as the significant from the viewpoint of cellular activity were determined as well. L929 cells adhesion and morphology ware analysed by immunohistochemical staining for actin and nuclei. Cell activity and proliferation were analysed also.

It is evident that conditions of PCL films preparation affect the morphology of spherulites. All samples were birefringent, indicating in general crystallinity, being different for particular samples. Maltese cross was observed in few samples. Crystallinity of PCL films determined from DSC measurements was in range 0,45-0,70 depending on solvent and polymer molecular weight used. Young Modulus strongly depends on Mw of PCL and Ge additive. L929 cells interact with subtract; morphology and proliferation degree change with crystallinity and elasticity of one- and bicomponet films.