



Symposium E

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Faculty of Physics

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Biomimetics and regenerative medicine

Tailoring of polycaprolactone crystallinity

Authors: D Kolbuk(1), P Denis(1), E Choinska(2), P Sajkiewicz(1)

Affiliations:

(1) Institute of Fundamental Technological Research, Polish Academy of Sciences, Pawinskiego 5B, 02-106 Warsaw, Poland *email: dkolbuk@ippt.gov.pl

(2) Materials Science and Engineering, Warsaw University of Technology, Woloska 141 02-507 Warsaw, Poland

Resume: Introduction In the case of semicrystalline polymers, crystallinity is the parameter determining their physical properties. Some research groups indicate influence of crystallinity on cells response during in- vitro study. Commonly used methods of three-dimensional scaffolds formation do not take into account crystallinity optimisation. The aim of proposed presentation is to evaluate the effect of molecular weight and solvent on crystallinity and crystal size in case of polycaprolactone (PCL) films. Methodology Material: PCL with Mn:10, 45 and 80k g/mol (Sigma Aldrich) was used. As a solvents: Hexafluoroisopropanole, HFIP (Iris Biotech GmbH.), Acetic Acid, AA and Dichloromethane, DCM (Avantor and Chempol respectively) were used. Methods: Films were prepared from the PCL with different molecular weight using various solvents differing in evaporation rate. Characterization: Films were analysed using polarizing-interference microscopy (MPI) allowing characterization of spherulites morphology. Degree of crystallinity was analysed by differential scanning calorimetry (DSC) and comparatively by wide angle X-ray scattering (WAXS). Results and Discussion It is evident from MPI observations that conditions of PCL films preparation affect the morphology of spherulites. All samples were birefringent, indicating in general crystallinity, being different for particular samples. Spherulites size depends on Mw and solvent type; sharp Maltese cross was observed on few samples. Crystallinity of PCL films determined from DSC measurements was in the range 0,45-0,68 depending on solvent and polymer Mn used. Generally crystallinity of films formed from DCM is lower than from AA as a result of lower boiling point of DCM. Additional annealing enables increase in crystallinity to 0,8. WAXS crystallinity correlates with values determined by DSC. Changes of full width of half maximum (FWHM) of crystal peaks indicate variations of crystal size and/or defects depending on molecular weight and solvent what correlates with MPI observations also. Conclusions spherulites shape and crystallinity are strongly dependent on Mn and solvent type. Structural parameters of films decide on Young modulus and elasticity in terms of applications.