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Poly(glycerol sebacate) – Poly(L-Lactide) nonwovens. Towards attractive electrospun material for tissue engineering

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INTRODUCTION: Bicomponent nonwovens consisting of two biodegradable polyesters were electrospun and subjected to investigations.

METHODS: Poly(glycerol sebacate) (PGS) was synthesized using equimolar ratio of glycerol and sebacic acid monomers. Two types of prepolymers were synthesized – one with relatively low degree of esterification (DE) (prepolymeric, Prep), and the other one with higher DE (semi-crosslinked, S-C). Next it was blended with poly(lactic acid) (PLA) in three ratios, and electrospun using hexafluoroisopropanole (HFIP) solvent. Subsequently nonwovens were cured at high temperature (135^{o}C) within 3h - 48h, under vacuum in order to crosslink PGS. Electrospinning process was optimized at preliminary stage. PGS crosslinking conditions were selected on the basis of two meaningful publications about optimizing PGS properties [1, 2]. Materials were characterized and analyzed using various methods: scanning electron microscopy (SEM), differential scanning callorimetry (DSC), Fourier-transform infrared spectroscopy (FTIR).

RESULTS: Both morphology and structure differ much when comparing samples with various types of PGS, and with various content of PGS within nonwoven. Higher crosslinking degree should preferably enhance PGS elastic properties, however it does not seem to occur in case of bicomponent nonwovens. In addition, nonwovens with various content of PGS are not equally susceptible to crosslinking. The higher content of PGS, the longer time is required to achieve the same crosslinking degree.

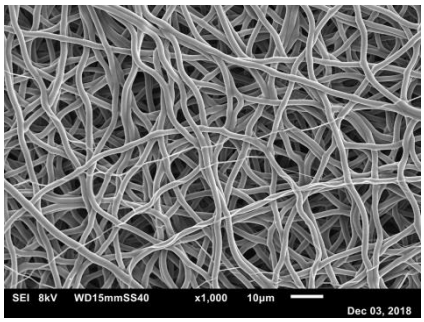

Figure 1: Electrospun nonwovens, PGS:PLA 1:1

DISCUSSION & CONCLUSIONS: Bicomponent, electrospun nonwovens may be promising but in the case of PLA-PGS system it seems to be difficult to take the full advantage of PGS elasticity.

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