

Description for the general public

The aim of the project is to obtain polymeric nonwoven using electrospinning method and to characterize its properties. Material will consist of two components. One will be poly(glycerol sebacate), PGS – polyester with elastomeric-like properties, with good elasticity. The second component of nonwovens will be the other biodegradable polymer, from polyesters group. Electrospun materials consisting of popular, biodegradable polyesters usually lack hydrophilicity and elasticity. Addition of PGS to the polymeric system is likely to modify properties of polylactide (PLA) or its copolymer PLGA in a way to make them more appropriate for application within the scope of soft tissues engineering e.g. connective tissue or some muscles. Soft tissues are largely composed of collagen and elastin fibers. Mechanical properties of PGS are similar to native fibrous structures in soft tissues, but reproducibility of PGS using electrospinning method is very complicated. The use of PGS as an additive in bicomponent polymeric system partially bypasses typical problems and it modifies, in a potentially positive way, properties of the so-called carrier material – the second component. To achieve it and to estimate the real potential of such material, elementary research studies are indispensable.

First, PGS prepolymer needs to be synthesized, applying adequate conditions of the synthesis. In the next stage, prepared blends with other polyester will be processed using electrospinning method to obtain bicomponent nonwovens. Then, prepared materials will be stored in high temperature in order to crosslink PGS. As a result of thermal treatment, the properties of the other polymer will change as well. Prepared materials, after observations on scanning electron microscope, will be mechanically tested, molecular and supermolecular structures will be characterized. Thermal analysis will be done as well and basic tests (cytotoxicity) will be carried out towards more advanced, cellular tests in the future.

Adoption of such research subject is dictated by interest, potential, utilitarian attractiveness of the subject matter and fairly wide experience of the proposer in materials processing via electrospinning method. The use of the material with elastic properties (PGS) seems to be very interesting in the context of tailoring completely different and new properties of commonly used biodegradable polyesters and it may provide possibility to modify it to better respond to the needs of soft tissues engineering.