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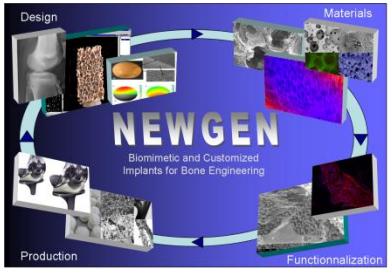
GENERAL PRESENTATION

- **Complete denomination**: Kaunas University of Technology
- **Location (city, country)**: Kaunas, Lithuania
- **Director**: prof. Petras Baršauskas
- **Contact person in NEWGEN**: Sigitas Stanys (sigitas.stanys@ktu.lt)
- **Working Group involvment**: WG2
- **Staff**: Sigitas Stanys, Virginija Jankauskaitė, Erika Adomavičiūtė, Kristina Žukienė

- **Research topics**: The formation of micro- and nanoporous biotextile scaffolds
- **Researchers expertises**: Material Science

Sigitas Stanys
Kaunas University of Technology
Faculty of Mechanical Engineering and Design
Department of Materials Science
Studentu str. 56, LT-51424
Kaunas, LITHUANIA



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BIOMATERIALS/NEWGEN TOPICS

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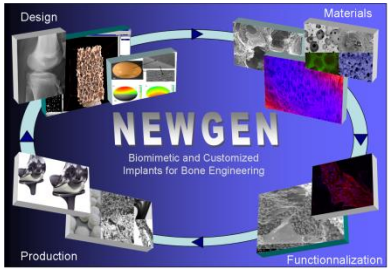
Scaffolds are one of the most important components which interacts with cells and growth factors to regenerate a tissue. In our body, the extracellular matrix (ECM) is similar to the scaffold of nanofibrous structure.

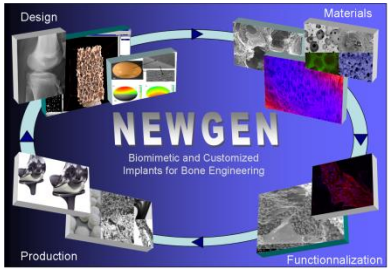
Electrospun nano-micro scaffold has specific characteristics : it has high surface area, diameter of fibers 50 – 500 nm, high porosity. These structural characteristics let to enhance cell attachment, migration and tissue in-growth. According scientific literature the electrospun scaffold is of particular interest in bone tissue applications.



Electrospinning is a simple and versatility method for fabrication of nano-micro scaffolds. Electrospinning involves an electric field that is applied to polymer solution, which is drawn into nano-microfibers by the electric force.

Many polymers solutions are possible to electrospin: poly(lactic acid) PLA, poly(glycolic acid) (PGA), poly-ε-caprolactone (PCL), polyhydroxybutyrate (PHB), polyvinylalkochol (PVA), polyurethane (PU), polyamide -6 (PA-6), silk fibroin, chitosan and et.c

In polymers solutions may be incorporated hydroxyapatite, Ag, Cu, Au and others solid particles and electrospun materials may be formed.



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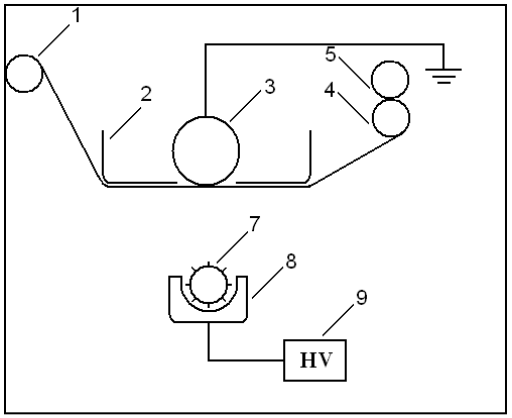
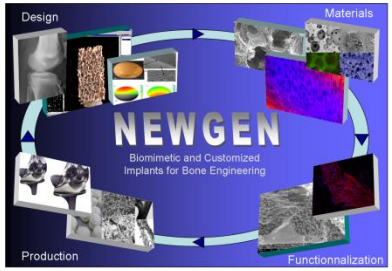
Electrospinning equipment in KTU Department of Materials Engineering

Photos (from www. Elmarco.com) of electrospinning Nanospider TM equipment situated in KTU Department of Materials Engineering



Principal scheme of electrospinning Nanospider TM equipment: 1- delivery roller of support material, 2,3 – grounded electrode, 4,5 –rollers of support material with layer of nano-microfibers, 7-rotating electrode, 8-tray with polymer solution, 9- applied voltage



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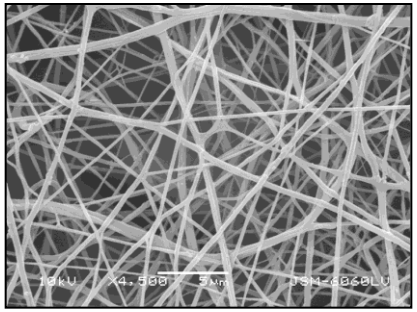
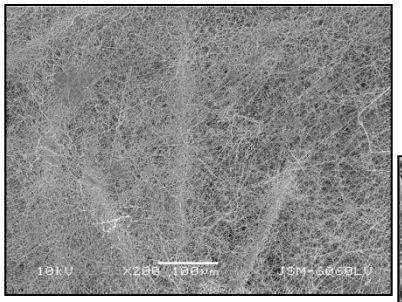
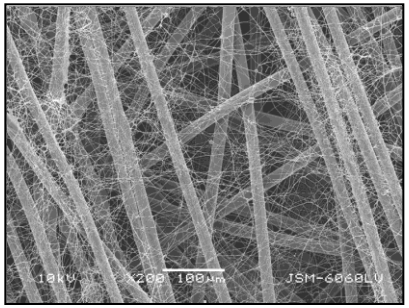
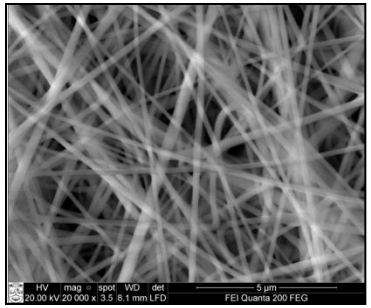
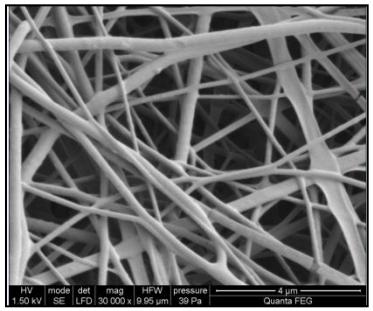
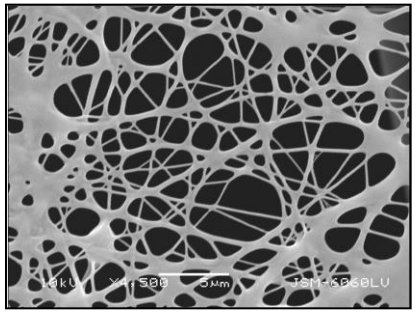


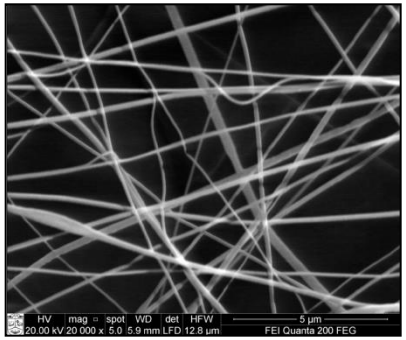






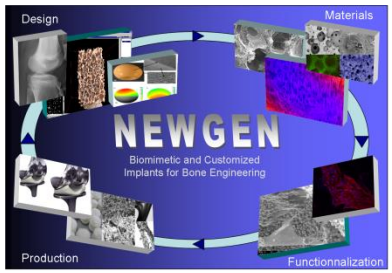






The structure of electrospun materials depends from type of polymer, solvent, electrospinning technological and environmental parameters. It is possible to form biocompatible electrospun material with solid particles (for example CaHAp, Ag, Cu).

The structure of electrospun materials (at different scales) formed in KTU Department of Materials Engineering



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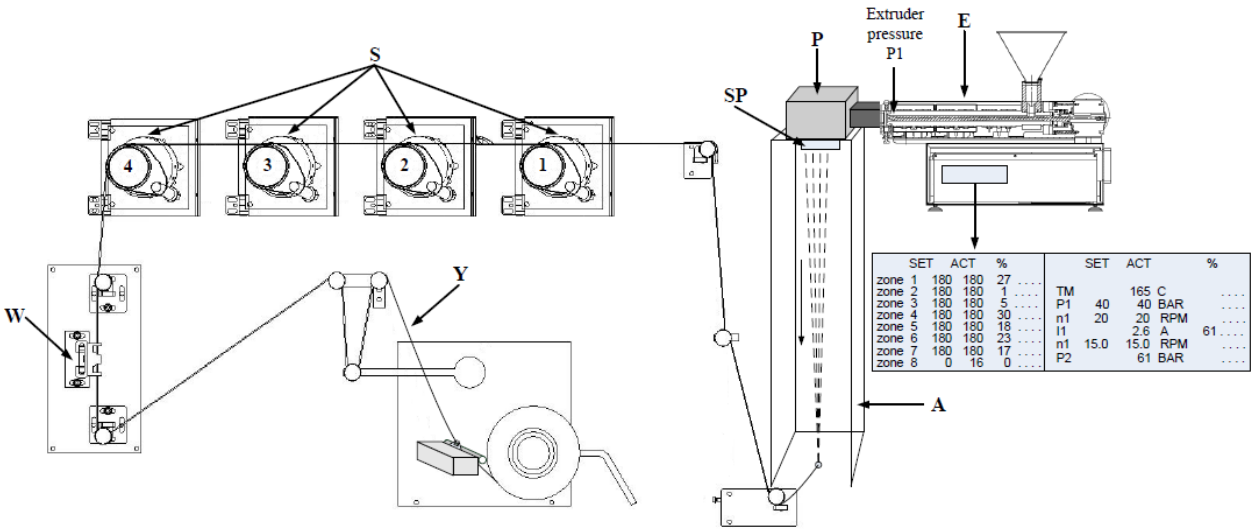
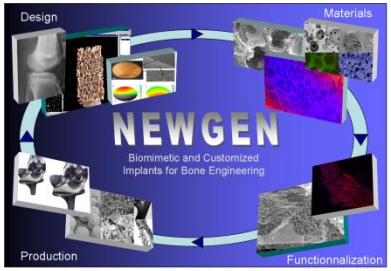
Melt spinning of multifibers yarns equipment in KTU Department of Materials Engineering



From biocompatible termoplastic polymers (PLA) is possible to form biocompatible microfibers (diameter 20-40μm) yarns.

Principal scheme of the spinning equipment COLLIN ® CMF 100 (Dr.Collin Gmbh, Germany): E- extruder, P-melting pump, SP-spineret, A-air quench cabinet, S-streching godets, W-whirling unit, Y-multifibers from microfibers yarn.



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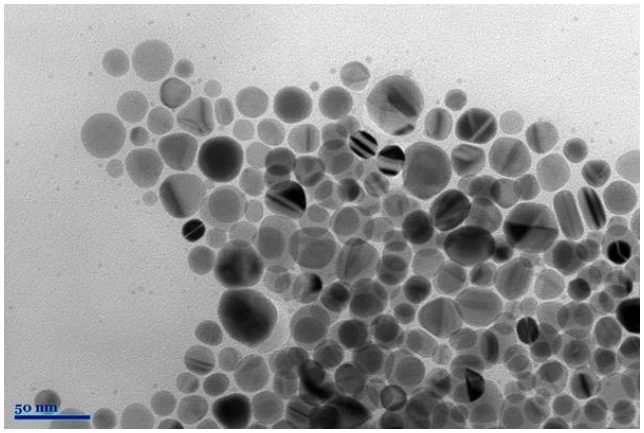
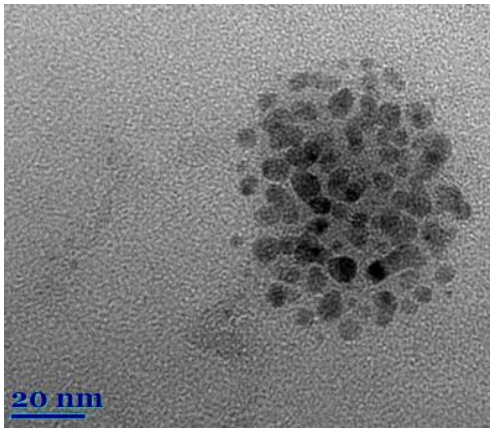
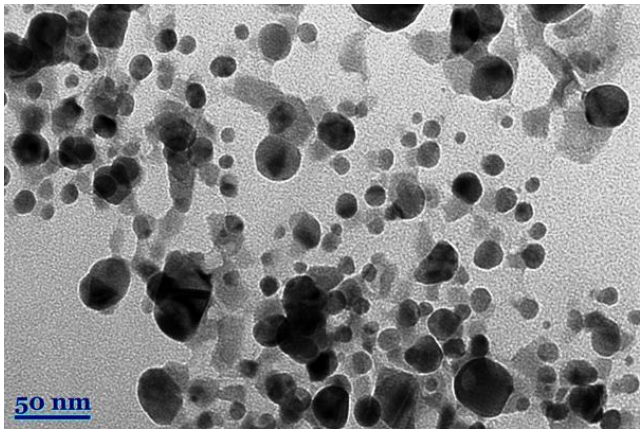
Nanoparticle synthesized in KTU Department of Materials Engineering



Ag nanoparticles

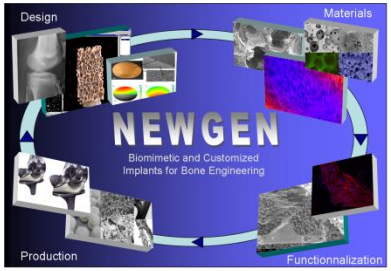


Cu nanoparticles



Ag +Cu nanoparticles synthesized *in situ*

The structure of metal nanoparticles by prof. V. Jankauskaite at KTU Department of Materials Engineering



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