

## **BIODEGRADABLE POLYMER SCAFFOLD REINFORCED WITH CARBON NANOTUBES MODIFIED WITH MAGNETIC PARTICLES**

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### **Abstract**

3-D porous biodegradable polymer nanocomposites are widely used as scaffolds in bone regenerative medicine. Incorporation of magnetic particles into polymer matrix enables to create useful tool, which in the presence of external magnetic field, would stimulate and accelerate regeneration process [1]. Carbon nanotubes, because of their excellent mechanical properties, are a popular reinforcement of polymer nanocomposites [2]. The aim of these studies was to prepare and characterize a novel polymer nanocomposite with magnetic properties. For this purpose, carbon nanotubes-iron oxide hybrid nanoparticles were used as a nanoaddition and a biodegradable poly(-caprolactone) polymer served as a matrix. Percentage content of the hybrid particles was 1% with respect to polymer weight. 3-D porous scaffolds were fabricated using solvent casting/particulate leaching method. As a porogen, sodium chloride was used. Prepared materials were characterized using micro-Computed Tomography (-CT), scanning electron microscopy (SEM), Zwick testing machine and Vibrating Sample Magnetometer. Performed experiments revealed presence of pores in two fractions of sizes: large, corresponding to the shape and size of salt's grains, as proven by the -CT, and smaller pores, visualized by the microscopic observations. Additionally, presence of assorted agglomerates was observed, with sizes inversely proportional to their number. Magnetic measurements indicated that both the nanoaddition and the polymer nanocomposites possess superparamagnetic properties. Compared with pure poly(-caprolactone) scaffold, slight increase of the Young's moduli was observed. Thus, the conducted studies proved that the introduction of hybrid particles into polymer matrix allows obtaining magnetic nanocomposites with improved mechanical properties.

**Keywords:** Polymers, nanocomposites, magnetic, carbon nanotubes

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