SHISH-KEBAB STRUCTURED POLY(ε-CAPROLACTONE) NANOFIBERS AS A NOVEL MATERIAL FOR GRADED IMPLANTS

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The use of biocompatible and biodegradable materials as implants is a promising approach to temporarily replace endogenous functions and replace tissue during a healing process. Electrospun fiber mats can be used in the field of tissue engineering and to engineer tendon/ligament-to-bone interfaces,[1] showing high surface to volume ratio and a good roughness, which is promising for initial cell attachment and growth.[2] Using Polycaprolactone (PCL) as a basic material for implants is favorable because of its good mechanical properties and its slow degradation. However, due to its hydrophobic characteristics PCL is an unfavorable material for cell attachment and growth. Multiple approaches have been made to improve the cellular behavior such as plasma treatment or chemical modification.[3] Another approach uses a "shish-kebab" coating of the electrospun fibers. Chitosan (CS)-PCL graft copolymers (CS-g-PCL) can spontaneously crystallize as kebabs on PCL nanofibers which act as "shishes".

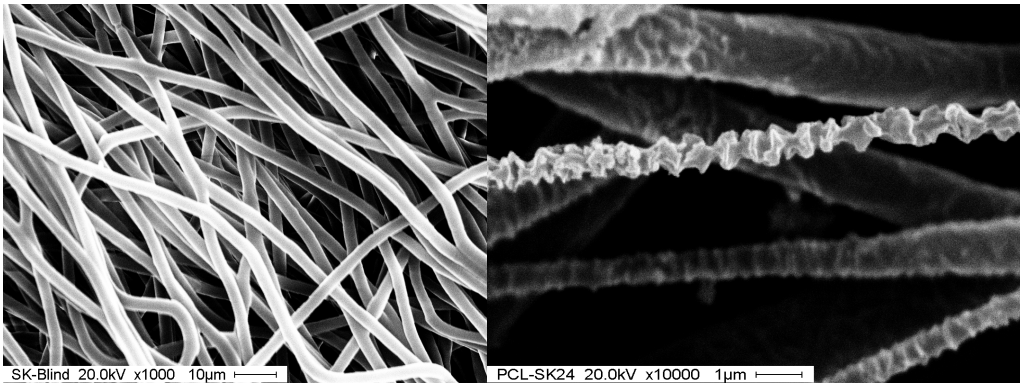

Figure 1: SEM images of oriented PCL nanofibers (left), shish-kebab structured PCL nanofibers (right)

The "shish-kebab" coating of CS-g-PCL onto electrospun PCL fibers is a fast and scalable approach to create fibermats which are more attractive for human cells and allow modification with nanoparticular drug-release systems by electrostatic adsorption. All modifications have been confirmed using SEM and CLSM. The encapsulation and release of ciprofloxacin and BMP-2 from the modified scaffolds has been carried out successfully.

[1] Font Tellado et al., Advanced drug delivery reviews 2015, 94, 126–140.
[2] Mirjalili, M.; Zohoori, S., J Nanostruct Chem 2016, 6 (3), 207–213.
[3] Jing et al., ACS Appl. Mater. Interfaces, 2015, 7 (12), pp 6955–6965