# Surface modification of electrospun fibers with silk fibroin

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This report presents a method of surface coating with silk fibroin (SF). Since silk proteins have been characterized by high biocompatibility, low cytotoxicity and biodegradability they are applied to modify various surfaces including textile ones. In this study, the fibrous system coated with SF was designed for the sustained release of active substances. The electrospun polycaprolactone (PCL) fibers containing a model antibiotic of ciprofloxacin (CIP) were applied as a core. The outer shell layer is formed by facile coating with SF from an aqueous solution and further crystallization of the SF layer by ethanol vapor to make SF insoluble in the biological environment. The ethanol-treated SF layer was insoluble in water for over a week. SF was obtained from cocoons of *Bombyx mori* by degumentation, fibroin dissolution, and dialysis [1]. It was found that the wetting pre-treatment of water/isopropanol 1:1 (v/v) is a key issue for efficient SF coating formation. The mean diameters of the fibers are about 1.77, 1.88 and 1.85 µm respectively for PCL, PCL/SF and PCL/SF_cryst fibers and SF layer thickness was about 100 nm (SEM). FTIR and Raman spectroscopies showed typical assignments for PCL nanofibers and additional bands related to CIP and SF presence. SF layer after the ethanol treatment shows the dominant contribution of β-sheet structures in protein, typical for crystalline SF.

The water contact angle analysis revealed that SF coating make the fibers hydrophilic surface.
CIP release from PCL fibers, according to the Fickian diffusion mechanism, is controlled by diffusion through the amorphous regions of the polymer matrix [2]. SF layer slows down the rate of CIP release. The quantitative evaluation of CIP activity in liquid media indicated comparable efficiency of antibiotics for SF-coated and uncoated sample of about 98 % for *S. aureus* and *K. pneumoniae*, (The bacterial growth reduction). However, the SF coating affected CIP release rate and the inhibition zone for *both bacteria strains* was smaller.
Our findings indicate that SF coating can be applied to modify the properties of textile structures and control of drug release.

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[1] A. Baranowska-Korczyc et al.Materials, 2021, 14(22), 6919.
[2] A. Baranowska-Korczyc et al. RSC Adv., 2026, 6, 19647.