Multilayered chitosan-based coating on electrospun nanofibers

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Chitosan is a natural polymer derived from the chitin of crustacean or mushroom shells, that intrinsically presents haemostatic, mucoadhesive, antimicrobial and immunostimulant properties. This polysaccharide has shown a great potential for biomedical and pharmaceutical applications, on account of its remarkable compatibility with physiological medium. Besides, it is degraded in a physiological environment into non-toxic products, which make chitosan an outstanding candidate for short- to medium-term applications.
In this respect, nanometric fibers are highly interesting as their assembly mimics the skin extracellular matrix structure. Such nanofibrous materials can be prepared by electrospinning (ESP). This technique uses a high voltage to create an electrically charged jet of polymer solution or melt which leads to fibers formation. Depending on the polymer characteristics (a.o. molecular weight, solution viscosity and conductivity) and processing conditions (electric potential, distance between syringe-capillary and collection plate, concentration, flow rate), polymer fibers ranging from nanometers to a few microns in diameter can be obtained and subsequently used as potential scaffolds, a.o. to form a temporary, artificial extracellular matrix.

In the present study, electrospinning technique was combined with layer-by-layer deposition method (LBL) – a well-known method for surface coating, based on electrostatic interactions – in order to prepare multilayered chitosan-based nanofibers. The antibacterial properties of the obtained material were then assessed, and the presence of a multilayered deposit was confirmed by several techniques.

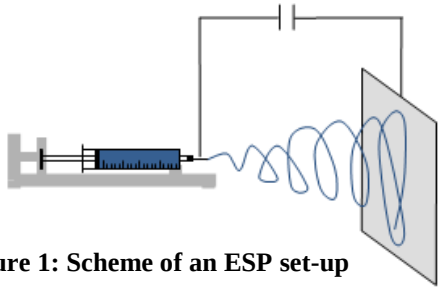

Figure 1: Scheme of an ESP set-up

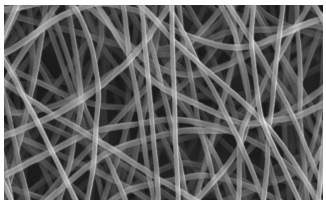

Figure 2: SEM analysis of electrospun nanofibers

References:
1) A. Formhals, *US Patent 2187306*, **1940**.
2) S. Ramakrishna, K. Fujihara, W.E. Teo, C.T. Lim and Z. Ma, *« An indroduction to electrospinning and nanofibers »*, Singapore, World Scientific Publishing Co. Pte. Ltd., **2005**.
3) G. Decher, *Science*, **1997**, 277, 1232.

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