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Several types of ligands for the covalent immobilization of proteolytic enzymes onto silica nanofibers

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The necrotic tissue emerging in certain types of wounds is necessary to remove in the first wound healing phase. Removing of this tissue is called the debridement. The most commonly used surgical debridement is very painful and damages the surrounding healthy skin tissue. On the other hand, the painless enzymatic debridement catalysis the proteolytic reactions (hydrolysis of the peptide bonds, that link amino acids together in a polypeptide chain). However, most enzymes are active only for a short time and under the specific conditions. The catalytic activity of enzymes can be increased e.g., by immobilization of enzymes onto the biocompatible silica nanofibers. The nanofibers must be functionalized by suitable reagents to form a ligand between silica nanofibers and amino groups of proteolytic enzymes. There are many ligands, but most are inappropriate for use in health care, e.g., glutaraldehyde. In our research, the nanofibers surface was modified by 3-Aminopropyl triethoxysilane firstly, than functionalized with several types of ligands, e.g., succinic anhydride and N-Hydroxysuccinimide ester. The proteolytic activity of bacterial, plant and animal enzymes was tested by Lowry method and Folin and Ciocalteu reagent with a small modification. Casein was used as the substrate. Proteolytic activity of enzymes was tested under conditions simulated skin burns environment (temperature of 37 and pH 4.6). Effect of temperature and pH value on enzyme activity was measured too.

Biography

Danilova Iveta is a PhD student in the field of Materials Engineering and Textile Technology, Technical University of Liberec, Czech. Her topic of dissertation thesis is Development of Nanofibrous Materials for Biomedical Applications, and her supervisor is an Associate Professor (Irena Lovetinska-Slamborova).

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