

PREPARATION AND CHARACTERIZATION OF NANOMODIFIED FIBRES

Majda Sfiligoj-Smole, Silvo Hribernik, Karin Stana-Kleinschek, Tatjana Kreze,
Julian López-Viota Gallardo, Slava Jeler

*Laboratory for Characterization and Processing of Polymers, Faculty of Mechanical
Engineering, University of Maribor, Smetanova 17, SI-2000 Maribor, Slovenia,
majda.sfiligoj@uni-mb.si*

Recently functionalisation of polymer materials to achieve smart and intelligent properties is being the target idea of several research projects. There are numerous application possibilities of these modified materials; e.g. production of intelligent and high functional textile products and clothing, medicine, filtration techniques, etc. Polymer materials of high functionality can be obtained by use of special polymers, polymer blends and by polymer modification by additives, respectively. In addition, for the modification nanocoatings and chemical binding of poly-functional reagents are of the major importance. However, nanomodified fibres are the most promising as nanotechnology is considered to influence several physical properties, i.e. electrical conductivity, magnetic properties, corrosion protection, friction control, abrasion resistance, water and oil repellence, soil release, biocompatibility, flammability, etc. of existing material and therefore it represents an excellent origin for planning new and advanced materials.

Nanocoated fibres

Nanocoated fibers are defined as fibers coated with a layer on the nanometer scale. To obtain nanocomposites and structured materials in order to achieve new and improved properties of textiles different techniques are used. Nanoparticles such as antimicrobial silver, photo-active TiO_2 , conductive, UV absorbing particles (ZnO), etc are involved in textile functionalization. In the presentation some examples of fibres nanomodification by nanocoating will be presented.

1/ Applications of monodisperse silica particles (SiO_2) are rapidly increasing, not only in the scientific field, but also in the commercial industrial fields; advantages of SiO_2 particles are currently used mostly by chemical and pharmaceutical industry (controlled drug release), biological sciences and industry of advanced and high-tech materials. Nano size SiO_2 particles are used for altering of materials' surface properties, for enhancement of mechanical properties and durability of materials. SiO_2 coatings also influence material's functionality, activity or can enhance its stability. Layer of silica was grown on the surface of regenerated cellulose fibres via sol-gel process with aim to test the flame retardancy of the resultant organic-inorganic composite.

2/Self-cleaning surfaces based on photocatalysis are an extremely promising nano-technological field of extensive research and development. Recently comprehensive research work has been performed to evaluate the optical, photocatalytic and antimicrobial properties of TiO_2 nano-particles and composites thereof. The aim of our study was to obtain self-cleaning properties for regenerate cellulose surfaces by nano-modification, using TiO_2 nano-coating. Modified fabrics with self-cleaning effect were prepared and analysed i.e. the modification efficiency was determined.

3/Nanomodification of textiles by magnetic particles alters their protective ability against electromagnetic radiation caused by different advanced devices. Iron magnetic particles were precipitated from the solutions of iron salts in the presence of ammonia as a catalyst and a nanocoating on regenerated cellulose fibres was prepared. Surface of modified fibers with layers of nano particles was characterized and the properties were determined.