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PLASMA POLYMERIZED POLY-PYRROLE FINISHINGS FOR ANTIBACTERIAL TEXTILES

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The market of antibacterial textiles has gained increasing importance in the last few years. The growth of micro-organisms has negative effects on textiles, such as the generation of odour and stains, which is a particularly important problem in biomedical and technical textiles. Nowadays, commercially-available antibacterial textiles usually use broad-spectrum biocides such as silver, quaternary ammonium compounds and triclosan as active agents. However, recent studies have shown that silver nanoparticles are able to penetrate into the cells, damaging the genotype. Besides, triclosan forms chlorinated dioxins, toxic for water-living organisms. Therefore, it is important to develop new materials for antibacterial textiles. One of the main approaches in the development of alternative antibacterial materials is based in the presence of positively-charged molecules that disrupt the cell wall of the bacteria. Polypyrrole, a widely known semi-conductive polymer, bases its conductivity on the delocalization of positive charges along its conjugated structure. Textile fibers treated with chemically-synthesized polypyrrole have good antibacterial activity. In this work, plasma polymerized polypyrrole coatings have been developed on textile yarns through RF plasma enhanced chemical vapour deposition (PE-CVD), which is an environmentally friendly alternative technique. Plasma parameters such as power discharge, monomer flow, pressure, time and gas carrier have been studied in order to obtain the highest conductivity and, therefore, the best antibacterial performance. Iodine doping increases significantly the conductivity of plasma polymerized polypyrrole. The adhesion to the fibers has also been studied and improved using argon plasma pre-treatment on the textile samples. Plasma polymerized polypyrrole coatings have been characterized through conductivity, FT-IR, SEM and XPS measurements. Antibacterial activity against *Escherichia coli*, *Staphylococcus aureus* and *Klebsiella pneumoniae* of coated textiles have been evaluated following the international standard test methods: ASTM E 2149 and EN ISO 20645.

Keywords

plasma polymerization
functional coatings
antibacterial