Poly(N,N-dimethylaminoethyl methacrylate) – a new Bioactive Modifier for Textiles

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Abstract

Poly(N,N-dimethylaminoethyl methacrylate) (PDMAEMA) is a multifunctional polymer that possesses a unique combination of chemical, physical, and biological properties, making it a promising material for numerous advanced applications. Owing to its pH-responsive behavior, antimicrobial potential, and excellent chemical versatility, PDMAEMA has attracted considerable attention in recent years, particularly in the fields of biomaterials and functional textiles. However, comprehensive research on this polymer is currently carried out in only a limited number of research centers worldwide, including Lodz University of Technology, Poland.
This presentation demonstrates the application of PDMAEMA for the surface modification of polypropylene (PP) and polylactide (PLA) nonwovens produced by the spunbond technology. It provides a comprehensive overview of the currently available approaches for incorporating PDMAEMA into textile materials, with particular emphasis on surface functionalization methods. Various modification strategies are compared with respect to the type of methodology employed, the solvent system, the composition of the reaction medium, processing temperature, and the average molecular weight of the polymer.

Special attention is devoted to the influence of these parameters on the final properties of the modified textiles. The presentation discusses key functional characteristics, including antimicrobial activity, bioactivity, hydrophilicity, dyeability, electrokinetic properties, and the thermal and hydrodynamic behavior of the resulting materials. The relationships between the modification conditions and the performance of the functionalized nonwovens are also highlighted.
The primary objective of this work is to summarize the current state of knowledge concerning the application of PDMAEMA in textile engineering and to demonstrate its significant potential for the development of advanced functional textiles. By presenting and comparing different modification techniques and their effects on material properties, this work aims to encourage the broader utilization of this relatively novel polymer in innovative textile applications, particularly in the biomedical, protective, and environmentally responsive sectors.

Keywords: polylactide nonwovens, textile properties, poly(N, N, dimethylaminoethyl methacrylate), practical applications

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