

Fabrication of multifunctional cotton by the deposition of zinc oxide nanoparticles

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The presented work demonstrates an environmentally friendly and comparatively cheaper method to stabilize the additives (nanomaterials i.e., nanoparticles, nanorods, nanowires) on the surface of textile fibrous materials to develop photo catalytically active multifunctional textiles. These functional materials are designed especially for biomedical applications e.g., antimicrobial coatings, wound dressings, bandages and plasters. The study was conducted by incorporating zinc oxide nanoparticles (ZnO NPs) on cotton fabric. In addition, physicochemical impact of ultrasonic rays on surface topography of cotton was also evaluated. In a single-step method, simultaneous synthesis and coating of ZnO NPs was successfully achieved. Morphological changes and surface topography before and after ZnO NPs deposition were estimated by inductively coupled plasma atomic emission spectroscopy and ultrahigh-resolution scanning electron microscopy (UHR-SEM). Alambeta and moisture management tester were used for thermal and moisture evaluation. The results of thermophysiological comfort of ZnO coated cotton were evaluated on the basis of thickness and ZnO NPs coated amount. In addition, the achieved results depicted the impact of sonication on surface roughness.

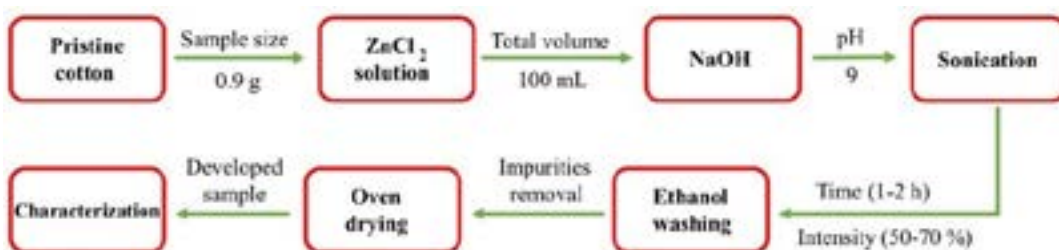


Figure 1: The procedure used for the development zinc oxide nanoparticles coated multifunctional cotton

Recent Publications

1. M.T. Noman, N. Amor, M. Petru, "Synthesis and applications of ZnO nanostructures (ZONs): a review". *Critical Reviews in Solid State and Materials Sciences*, 46(2), (2021), 1-44.
2. M.T. Noman, M. Petru, P. Louda, P. Kejzlar, "Woven textiles coated with zinc oxide nanoparticles and their thermophysiological comfort properties". *Journal of Natural Fibers*, 18(8), (2021), 1-14.
3. M.T. Noman, N. Amor, M. Petru, A. Mahmood, P. Kejzlar, "Photocatalytic behaviour of zinc oxide nanostructures on surface activation of polymeric fibres". *Polymers*, 13(8), (2021), 1-18, 1227.

4. M.T. Noman, M. Petru, N. Amor, P. Louda, "Thermophysiological comfort of zinc oxide nanoparticles coated woven fabrics". *Scientific Reports*, 10(1), (2020), 21080.
5. M.T. Noman, M. Petru, J. Militky, M. Azeem, M.A. Ashraf, "One-pot sonochemical synthesis of ZnO nanoparticles for photocatalytic applications, modelling and optimization". *Materials*, 13(1), (2020), 1-18, 14.

Biography

Muhammad Tayyab Noman received his Ph.D. in Textile Technics and Materials Engineering from Technical University of Liberec, Czech Republic. He is pursuing his career as a Recognized Researcher at Institute of Nanomaterials, Advanced Technologies and Innovation (CXI), Technical University of Liberec, Czech Republic. Through his research, he is trying to understand the reaction dynamics of photo generated charge carriers during photocatalysis, composites materials and the incorporation of variety of nanomaterials on textiles. He is the author and co-author of many scientific publications in area of fibrous materials and composites, characterization and optimization of fibre reinforced composite structures. In addition, he is a member of Editorial Board of "Polymers" as a Topic Editor and currently running a special issue "Advanced Textile Based Polymer Composites: Synthesis, Characterization and Applications".

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