

Hibiscus Sabdariffa Extracts: A Sustainable and Eco-Friendly Resource for Multifunctional Cellulosic Fibers

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Abstract : The utilization of natural products in finishing textiles toward multifunctional applications without side effects is an extremely motivating goal. Hibiscus sabdariffa usually has been used for many traditional medicine applications. To develop an additional use for Hibiscus sabdariffa, an extraction of bioactive compounds from Hibiscus sabdariffa followed by finishing on cellulosic fibers was designed to cleaner production of the value-added textiles fibers with multifunctional applications. The objective of this study is to explore, identify, and evaluate the bioactive compound extracted from Hibiscus sabdariffa by different solvent via ultrasonic technique as a potential eco-friendly agent for multifunctional cellulosic fabrics via two approaches. In the first approach, Hibiscus sabdariffa extract was used as a source of sustainable eco-friendly for simultaneous coloration and multi-finishing of cotton fabrics via in situ incorporations of nanoparticles (silver and metal oxide). In the second approach, the micro-capsulation of Hibiscus sabdariffa extracts was followed by coating onto cotton gauze to introduce multifunctional healthcare applications. The effect of the solvent type was accelerated by ultrasonic on the phytochemical, antioxidant, and volatile compounds of Hibiscus sabdariffa. The surface morphology and elemental content of the treated fabrics were explored using Fourier transform infrared spectroscopy (FT-IR), scanning electron microscope (SEM), and energy-dispersive X-ray spectroscopy (EDX). The multifunctional properties of treated fabrics, including coloration, sensor properties and protective properties against pathogenic microorganisms and UV radiation as well as wound healing property were evaluated. The results showed that the water, as well as ethanol/water, was selected as a solvent for the extraction of natural compounds from Hibiscus Sabdariffa with high in extract yield, total phenolic contents, flavonoid contents, and antioxidant activity. These natural compounds were utilized to enhance cellulosic fibers functionalization by imparting faint/dark red color, antimicrobial against different organisms, and antioxidants as well as UV protection properties. The encapsulation of Hibiscus Sabdariffa extracts, as well as wound healing, is under consideration and evaluation. As a result, the current study presents a sustainable and eco-friendly approach to design cellulosic fabrics for multifunctional medical and healthcare applications.

Keywords : cellulosic fibers, Hibiscus sabdariffa extract, multifunctional application, nanoparticles

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