Pathak and Prasad, J Textile Sci Eng 2014, 4:6
DOI: 10.4172/2165-8064.1000172

Journal of Textile Science & Engineering

Opinion Open Access

Applications and Prospects of Microbial Polymers in Textile Industries

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Introduction

Microbial polymers aka exopolysaccharides (EPS) portray diversified roles with respect to human utilization in various fields which includes textile industry, medicine, dairy industry, agricultural industry, bakery industry, civil industry as well as oil industry and cosmetics, neutraceuticals, etc. depicting their biotechnological significance [1]. The market potential of exopolysaccharides has attracted the researchers to show interest towards EPS production. An increasing awareness for environment and new look for applications of greener technology will probably go for microbes as a renewable resource of exopolysaccharides. Moreover, some modifications in natural polymers can augment the mechanical properties and the degradable rate of fabrics [2]. Some important microbial polymers having emerging role in textile world are briefly discussed in this article.

A water soluble polymer, pullan, is produced by microbe named *Aureobasidium pullalans* [3]. Chemically modified pullan is either less soluble or completely insoluble in water. This especial attribute of this polymer can be used in water repellant fabric industry. Thus, they can have application in production of water resistant raincoats and covers used to protect vehicles, etc [4].

Linear polysaccharide alginate is produced by soil bacterium [5]. They are hydrophilic in nature and can acts as a water binding agent. Alginate fibers are widely used in novel dressing materials and wound healing bandages because of its special mannuronic acid ability [6]. Alginate possess high moisture absorption value and this hydrophilic character can be used in sports apparel which helps to keep athletes body dry by absorbing sweat [7]. Another significant application of calcium alginate fibers is its flame retardancy. It is an effective barrier to the outward diffusion of flame and heat because of the rigid combustion residue char. This fabrics can be used in production of upholstered furniture and furnishing décor textiles along with work clothing, firefighter apparel, institutional draperies, institutional upholstery, institutional and commercial carpet, transportation, military garments, and bedding [8].

Microbial cellulose represents the most characteristic family of these natural polymers in textile industries. This polymer is produced by a microbe named *Acetobacter xylinum* [9]. Bacterial cellulose can replace plant cellulose fibrils at commercial level as it is thinner and possess high tensile strength. Moreover it also depicts higher degree of polymerization, better water holding capacity, and a high crystallinity index [10]. They are widely used in wound dressing materials owing to its high porosity and can also be used as an advanced clothing material for burn wounds patients [11].

Microbial polymer matrices are also known to be used for synthesis of nano particles which have bettered bonding properties with fabrics and thereby confer desired characteristics. This property helps in production of wears having features like antimicrobial effect, flame retardancy, oil, water and dust repellency, moisture management, UV protection, fragrance delivery, improved electric conductivity, and so on.

Furthermore, microbial polysaccharides are gaining interest in production of medical dressing fabrics also. The aubasidan and rodexman fibres have protective and therapeutic function, and are used for preparation of unique dressing cloth materials for wounds. When such fibers are placed on wounds and burns, they provoke reparative response, have an anti-inflammatory and healing effect, and are free from side effects and/or allergic reactions [12].

From these proceedings, it appears that microbial polymers shall observe tremendous potential in the textile industry in near future.

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Received November 03, 2014; **Accepted** November 04, 2014; **Published** November 06, 2014

Citation: Pathak H, Prasad A (2014) Applications and Prospects of Microbial Polymers in Textile Industries. J Textile Sci Eng 4: 172. doi:10.4172/2165-8064.1000172