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Short Communication

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Engineering Textiles and Textile Processing for Environmental Safety and Health

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Processing of textiles result in generation of effluents that contaminate water resources and textile processing is one of the major sources of water pollution all across the world. Sizing process during the textile production is essential for providing the strength and the abrasion resistance to the yarns that is required for bearing the load during weaving. More particularly the sizing and desizing operations consume significant proportion of water resources in the textile plant. For this, sizing agents are used extensively. On a global scale the sizing solutions are consumed at the rate of one million tons every year. Generally, polyvinyl alcohol (PVA) is use widely as a sizing agent for synthetic fibers and their blends as it is water soluble and has better sizing performance [1]. PVA is the most used sizing agent and hence a major contributor for chemical oxygen demand (COD) and contributes to nearly 40% of the textile warping, slashing, weaving, desizing, scouring, bleaching, dyeing, printing, and finishing process. However, polyvinyl alcohol is not degradable easily and is the major contributor for pollution caused by textile processing effluents. Untreated PVA when disposed into the ecosystem can pollute the environment and accumulate in the animal or human body through the food chain and may adversely affect the health.

With a view on environmental safety and sustainability, a modified form of starch was suggested as the alternatives for PVA. However, the starch does not meet the desired performance and the cost is also on par with the PVA and hence does not offer significant economic benefits. Corn distillers has low protein yield and hence is not recommended as a sizing agent. Therefore, other agricultural waste and byproducts were evaluated as alternatives for the sizing agents. Some studies described the environment friendly and cost-effective substitute to polyvinyl alcohol in the form of soy proteins. Soy proteins are easily available, cost-effective, and biodegradable and have been widely studied for potential applications in textile packaging as resins and adhesives. Soymeal has high amount of soluble and was found to have desirable properties as protein based sizing agent. Other protein sources from agriculture and agricultural products are very costly and therefore they are not used for profitable sizing operations. Research studies have demonstrated that polyester and cotton rovings were effectively sized with soy proteins displaying improvement in the strength and abrasion resistance than PVA. Soy proteins are biodegradable due to a 5 day biochemical oxygen demand and an oxygen demand ratio that is higher than that of PVA. Moreover, the total nitrogen and the ammonia nitrogen released from the soy proteins do not affect the environment adversely [2].

Another study evaluated the acoustic properties of the biodegradable composites materials with textile inserts for their protective role in the urban habitat. Absorption of the sound is regarded as the most important acoustical properties of the materials used in the sound insulation, sound barrier walls and surfaces [3]. One of the most common sound absorption coefficient measurement methods is the internationalized standardized impedance tube method. The textile incorporated biodegradable sound barrier materials have substantial environmental relevance.

Textile industry has immense role in the medical, healthcare and hygiene sector. Ultrafine fibers that are obtained by electro spinning of the biodegradable and biocompatible polymers were recently developed. These fibers have special features such as high surface to area to volume ratio small pore size, high porosity, and the potential to incorporate therapeutic compounds [4]. Electrospun fiber has several applications in wound healing, artificial skin grafting, as membranes for selective separation, target delivery of the bioactive components and molecules and also as scaffolds for tissue and bone engineering. These fibers were found to promote tissue regeneration. The submicron dimensions of the electrospun fibers enable better wound healing, compared to other materials such as cotton fibers as they are highly biocompatible and biodegradable.

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