Journal of Polymer Research (2021) 28:322
https://doi.org/10.1007/s10965-021-02663-2

ORIGINAL PAPER

Latex reinforced waste buffing dust-jeans cotton composites and its characterization

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Received: 7 January 2021 / Accepted: 12 July 2021

Abstract
This study aims to fabricate flexible composite sheets from waste buffing dust and post-consumer cotton waste through a simple solution casting technique. Natural rubber latex (NRL) was used as a binder material in different mixing ratios. To validate the chemical bonding between buffing dust and cotton fiber, FTIR was performed. Thermal stability of as-prepared composites was confirmed through TGA and DTA studies., The surface tropology of fabricated composites, were examined by FESEM analysis. From the results of oxygen gas transmittance rates, it was found that prepared composites possess enhanced gas barrier properties as compared to pure buffing dust. The physical and mechanical properties such as tensile strength, elongation, hardness, and density of prepared composites with optimum NRL content were augmented by 58, 48, 35, and 21%, respectively, as compared to pure buffing dust sheets. Thereby, these simple, low cost and flexible composite sheets would be a promising material for packaging as well as interior decoration industries.

Keywords Composite · Latex · Solid waste · Cotton · Buffing dust

Introduction

The increasing demand for leather and associated goods are compelling the expansion of tanning units every year. During the conversion of raw hides/skins to finished leather, various organic and inorganic pollutants are generated as byproducts and pose a significant challenge to the surrounding environments and ultimately in bionetwork [1]. Specifically, the tannery wastes contain a wide range of solid wastes from trimming, shaving, and splitting, which poses with mineral components as well as animal fats, while liquid wastes comprising highly polluted wastewater and sludge with organic compounds [2–4]. The leather tanning process generates a substantial amount of solid waste since only a small portion of raw materials (20–25%) is converted to finished leather, while the remaining 75–80% is released into the environment as trash [5, 6]. In consequence, safe disposal of these solid wastes are imperative, and several waste management strategies such as anaerobic digestion, landfilling, and thermal incineration are widely employed. But these techniques encounter numerous environmental safeties like massive pollution of landfill sites, extensive workforce engagement provoking unhygienic situations, and a high chance to convert trivalent chromium (nontoxic) into carcinogenic hexavalent chromium (toxic) during thermal incineration at high temperature [7].

Similarly, a significant quantity of wastes is generated from the textile and garments industry, while a large percentage is from cotton and blended synthetic fibers. Uprising demand for clothing outfits results in large quantities of clipping, cloth scrap, and loose pieces, which are the prime factors for solid waste in the textile industry [8, 9]. In

Highlights:
1. The cellulose content of fiber is mainly responsible for the strength of composite
2. The collagen content of leather fiber is crucial for the flexibility of composite
3. Uniformity of network between collagen and cotton fiber is essential to consider
4. Excess fiber ends in the composite is resulting in the decrement of mechanical properties

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Published online: 30 July 2021