Study on the Preparation and Properties of Collagen Fiber- Polyurethane Composite Film

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Abstract

Chrome-tanned collagen fiber is the major solid waste of leather industry which is difficult to biological degradation and would caused serious pollution to the environment. However, the collagen fibers as a natural biological polymer materials, has unique properties of surface reactivity that the other polymer materials are not available. In this paper, the composite film of chrome-tanned collagen fiber- polyurethane (PU) were prepared is owing to H_2O induced phase separation, and measured water vapor permeability, permeability, mechanical properties and microstructure. The results showed that the composite film of chrome-tanned collagen fiber-PU have continuous porous structure, which can improve the water vapor permeability and permeability of film, but reduce the mechanical properties of film. Thermal gravimetric analysis (TGA) showed that the thermal effect of collagen fiber and PU did not change significantly, so composite of collagen fiber and polyurethane by H_2O induced phase separation belongs to physical process. The result demonstrates that this composite film has continuous porous structure, and collagen fibers with unique properties of surface reactions, so this material have potential applications in many fields.

First page example

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Study on the preparation and properties of collagen fiber- polyurethane composite film

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Keywords: composite film, collagen fiber, polyurethane, composite material

Abstract. Chrome-tanned collagen fiber is the major solid waste of leather industry which is difficult to biological degradation and would caused serious pollution to the environment. However, the collagen fibers as a natural biological polymer materials, has unique properties of surface reactivity that the other polymer materials are not available. In this paper, the composite film of chrome-tanned collagen fiber- polyurethane (PU) were prepared is owing to H_2O induced phase separation, and measured water vapor permeability, permeability, mechanical properties and microstructure. The results showed that the composite film of chrome-tanned collagen fiber-PU have continuous porous structure, which can improve the water vapor permeability and permeability of film, but reduce the mechanical properties of film. Thermal gravimetric analysis (TGA) showed that the thermal effect of collagen fiber and PU did not change significantly, so composite of collagen fiber and polyurethane by H_2O induced phase separation belongs to physical process. The result demonstrates that this composite film has continuous porous structure, and collagen fibers with unique properties of surface reactions, so this material have potential applications in many fields.

Introduction

For the leather industry, the main raw material is animal hides. The tanning process, in turn, generates much greater quantities of by-products and wastes than leather. One ton of wet salted hides yield only 200 kg of leather but over 600 kg of solid waste [1]. China as the world's largest production base of leather, solid waste generated about 140 million tons in one year, and the 30% of solid waste is chrome-tanned collagen fiber, which is difficult to biological degradation and causing serious environmental pollution. However, the collagen fibers as a natural biological polymer materials, has good mechanical properties and a large number of active groups such as carboxyl, amidogen and guanidine [2]. Surface reaction of collagen fibers is unique properties that the other polymer materials are not available.

Our research team has been committed to the treatment of solid waste of chrome-tanned collagen fiber, and developing high performance composite material of collagen fiber. In this paper, the composite film of chrome-tanned collagen fiber- PU were prepared is owing to H2O induced phase separation, which has continuous porous structure. This composite film can be used to prepare porous filter material, immobilized enzyme carrier material, heavy metal particle absorbing material, sound-absorbing composite materials, synthetic leather breathable coating materials [3-6]. Our research can treat large amounts of solid waste of collagen fibers, and solve the pollution problem, has a good economic and social benefits.