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Short Communication

Direct production of cellulose laurate by mechanical activation-strengthened solid phase synthesis

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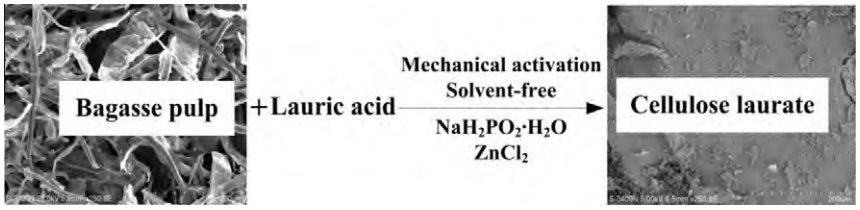
HIGHLIGHTS

- Mechanical activation and esterification were combined in the same equipment.
- No organic co-reagents and solvents were used for producing cellulose laurate.
- Mechanical activation destroyed the steric effect of long chain fatty acid.
- Mechanical activation increased the reactivity of hydroxyl groups in cellulose.
- We report a simple, efficient and green method for the synthesis of cellulose esters.

GRAPHICAL ABSTRACT



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ABSTRACT

This work reports that cellulose laurate could be directly produced by mechanical activation-strengthened solid phase synthesis (MASPS) in a customized stirring mill with using bagasse pulp and lauric acid as materials in an environmentally friendly way. Cellulose laurates with different degree of substitution were obtained under different synthesis conditions without the use of organic co-reagents and solvents. The characterization results showed that cellulose laurates had great changes in surface morphologies and crystal structures compared with bagasse pulp because of the intense milling and introduction of laurate groups, but still retained the cellulose I crystalline form of the native cellulose. MASPS could be considered as a simple, efficient and green method for the production of long chain cellulose esters.

1. Introduction

Cellulose, most ubiquitous and abundant polymer in nature, has intriguing structure and unique properties. The plenitude, renewability, biodegradability, and low cost of cellulose make it an ideal feedstock for producing different materials (Gremos et al., 2011). However, native cellulose does not exhibit any thermoplastic behavior or be dissolved in a common solvent, and accordingly limit its full potential applications (Crépy et al., 2011; Guo et al., 2009). In order to improve the properties of cellulose, esterification is usually used for cellulose chemical modification. After modification, the products, cellulose esters, possess desired physicochemical properties, especially thermoplastic properties. Long chain cellulose esters (LCCE, chain length of fatty substituent ⩾ C6), which show better thermoplastic properties and processability, have captured much attention recently, and various technologies are being pursued for the synthesis of LCCE (Bras et al., 2007;

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