435d Enzyme and Acid Mediated Production of Microcrystalline Cellulose from Agricultural Wastes

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Microcrystalline cellulose has a wide application in food, pharmaceuticals, and other industries. Most microcrystalline cellulose is produced from dissolving pulps using concentrated acids. We investigated steam explosion treatment of corn cobs and cotton gin waste for the production of microcrystalline cellulose. Steam explosion conditions varied from severities of 2.8 to 5.0. The corn cob was converted into a fine powder after steam explosion and the hemicellulose fraction was easily extracted with water and the lignolytic fraction was extracted with sodium hydroxide solution. The residual cellulose was first bleached with hydrogen peroxide and then converted into microcrystalline cellulose using hydrochloric acid, sulfuric acid and cellulase enzyme preparation. The resulting microcrystalline cellulose samples had properties that were comparable to commercial microcrystalline cellulose. Similarly, cotton gin was steam exploded and converted into microcrystalline cellulose. However, the cotton gin waste was more difficult to steam treat and the product was not readily bleached. Whereas the microcrystalline cellulose from the cotton gin waste appeared like fiber strands, those from the corn cob were particles when analyzed with scanning electron microscope.