

Synthesis and Characterization of Carboxymethyl Cellulose from Rice Stubble Cellulose

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Abstract : Rice stubble consists of a high content of cellulose and can be synthesized as a cellulose derivative such as carboxymethyl cellulose (CMC) to value added products from agricultural waste. Therefore, the synthesis conditions and characterization the properties of CMC from rice stubble (CMCr) were investigated. Hemicellulose and lignin were first removed from the rice stubble using 10% NaOH at 55 °C for 3 h and 5% NaOCl at 75 °C for 15 min, respectively. Rice stubble cellulose was swollen in 30% NaOH and isopropanol as a solvent. The content of chloroacetic acid (5-7 g in 5 g of alkali cellulose), reaction temperature (50 and 70 °C) and time (180, 270 and 360 min) were explored to obtain CMC. It was found that synthesis conditions did not affect significantly on moisture content and pH of CMCr. The best quality of CMCr was synthesized by using 7 g of chloroacetic acid and reacted at 50 °C for 180 min based on 5 g of rice stubble cellulose. Degree of substitution (DS), viscosity and purity of CMCr were 0.64, 36.03 cP and 90.18 %, respectively. Furthermore, Fourier transform infrared (FT-IR) spectroscopy confirmed the presence of carboxymethyl substituents. CMCr was categorized in commercial scale as a low viscosity material and it can be used as film forming packaging materials for food and pharmaceutical product applications.

Keywords : rice stubble, cellulose, carboxymethyl cellulose, degree of substitution, purity

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