Physicochemical procedures for fractionation of sugarcane bagasse and lignocellulose hydrolysis

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Lignocellulose is composed of cellulose (32-48%), hemicellulose (19-24%), lignin (23-24%) along with smaller amounts of pectin, nitrogen compounds, chlorophyll and waxes. Approximately 90% of the plant materials are stored in form of cellulose, hemicellulose, lignin and pectin. Over the years, a number of treatments of plant biomasses have been investigated, but only those employing chemicals currently offer higher yields at an effective low cost. Among the promising strategies used for preliminary degradation of the lignocellulose are those involving (H$_2$SO$_4$), alkali (NaOH, aqueous ammonia), oxidants (H$_2$O$_2$, hypochlorite). An improved pretreatment can reduce costs and accelerate commercial application. The combination of several treatments has been proposed to obtain both hemicellulose and amorphous cellulose fraction with reduced amount of lignin. In this work, sequences of pretreatments using chemicals (H$_2$O$_2$, commercial hypochlorite, NaOH, acetic acid) and temperatures were tried. Reducing sugars were assayed using 3,5-Dinitrosalicylic acid method. Folin-Ciocalteau method was used to assay phenolic compounds with vanillin as a standard. The procedure using alkaline H$_2$O$_2$ (4%) at 40°C gave the best yields of both hemicellulose and cellulose fractions showing low amounts of organic compounds derived from lignin. The hemicellulose fraction, resulted from this alkaline pretreatment gave the higher yield of hemicellulose. This hemicellulose fraction was submitted to an acid reflux (98°C) for 4 h giving a total reducing sugar of 0,26 g/ g of hemicellulose.

Key words: Cellulose, hemicellulose, sugarcane bagasse, chemical treatments, acid hydrolysis

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