CELL 91: Sugar produced from corncob pretreated with the combination of electron beam irradiation and enzymes

Abstract: Corncob is a lignocellulosic material composed of cellulose, hemicellulose, and lignin. Cellulose and hemicellulose are polysaccharides constituted of simple sugars (hexoses and pentoses). However, these sugars are difficult to access, due to the presence of lignin, which is a polyphenolic molecule that provides a high recalcitrance to plant tissue. An appropriate biomass pretreatment disrupts the hydrogen bonds in crystalline cellulose, breaks down cross-linked matrix of hemicelluloses and lignin, and raises the porosity and surface area of cellulose for subsequent enzymatic hydrolysis. There are several pretreatment methods including, physical pretreatment (electron beam irradiation, grinding and milling, microwave, and extrusion), chemical pretreatment (alkali, acid, organosolv, ozonolysis, and ionic liquid), physico-chemical pretreatment (steam explosion, liquid hot water, ammonia fiber explosion, wet oxidation, and CO_2 explosion), and biological pretreatment. This study evaluated electron beam irradiation (EB) in combination with enzymatic hydrolysis on corncob at different grain size to produce sugars. Dry biomass samples after characterization were exposed to EB radiation doses of 0, 30, 50, 70, 100, and 200 kGy. The pretreated biomass samples were enzymatically hydrolyzed using the Cellic CTec2 from Novozymes. The structural changes and degree of crystallinity of the pretreated biomass were studied by FTIR, DRX, DSC, TG and SEM analyses. Corncob *in natura* showed 6.3 % extractives, 40.3 % cellulose, 31.8 % hemicellulose, 17.3 % lignin, and 0.7 % ash. The EB in combination with enzymatic hydrolysis of corncob is an environmentally sound biomass pretreatment.

253rd ACS National Meeting / 2017
SESSION: Oral
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