

## Chemical characteristics and enzymatic hydrolysis of ozonated wood meals

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Since the role of lignin is to keep integrity and structure rigidity of lignocellulosic substrate, it is not unlikely that its association with the cellulose microfibrils prevent swelling of fibres, thus limiting enzyme accessibility. Otherwise, the ozone is a strong oxidizing agent which reacts readily with a mainly lignin in lignocelulosic substance. Therefore, the ozonated lignocellulosic substrate should be more susceptible to enzymatic hydrolysis because of the lignin in the surface of lignocellulosic substrate was removed readily with ozone.

The wood meals of aspen and pine were delignified with ozone in acidic solvent. The chemical characteristics and surface area of wood meals were investigated and the effectiveness of enzymatic hydrolysis was evaluated. The lignin contents were decreased dramatically with ozonation, the phenolic hydroxyl groups of lignin in ozonated wood meals were increased with ozonation. The condensed units of lignin in aspen wood meal were slightly increased with ozonation but the condensed units of lignin in pine wood meal were gradually decreased with ozonation. The sugar composition of ozonated wood meals showed that the hemicellulose was more susceptible to ozonation than cellulose. The lignin content was not inversely proportional to the surface area of ozonated wood meal. But, the rate of enzyme hydrolysis was inversely proportional to the content of lignin.

Table 1. The yield of residues and lignin content of ozonated wood meals and the rate of enzymatic hydrolysis.

Species		O <sub>3</sub> time (min)						
		O <sub>3</sub> 0	O <sub>3</sub> 10	O <sub>3</sub> 30	O <sub>3</sub> 60	O <sub>3</sub> 120	O <sub>3</sub> 180	O <sub>3</sub> 240
Pine	yield	100	90.4	85.7	76.3	70.8	63.3	60.2
	klason lignin	27.1	18.4	10.6	6.3	3.3	2.8	–
	uv lignin	0.7	0.9	1.2	1.2	1.2	1.1	–
	total	27.8	19.8	11.8	7.5	4.5	3.9	–
	rate of hydrolysis	14.1	26.2	36.5	48.6	60.4	80.2	89.6
Aspen	yield	100	87.5	83.7	79.2	72.5	66.7	
	kL	22.3	8.6	4.9	3.3	0.1	–	
	uv L	1.2	0.8	0.7	0.7	0.7	0.5	
	total	23.5	9.4	5.6	4.0	0.8	0.5	
	rate of hydrolysis	18.3	30.1	42.4	68.5	84.2	92.3	

Table 2. The content of phenolic–OH and products of nitrobenzene oxidation.

Species		O <sub>3</sub> time (min)						
		O <sub>3</sub> 0	10	30	60	120	180	240
Pine	rate of delignification	0	30.5	57.5	73.0	83.8	85.9	-
	phenolic-OH (m · mol/g · L)	0.68	0.76	0.84	1.23	1.29	1.30	
	vanilline (mol%/L)	32.9	23.7	26.5	31.1	31.4	31.2	-
	vanilline on original wood meal	32.9	16.4	11.2	8.4	5.1	4.4	
Aspen	rate of delignification	0	60.0	76.2	83.0	98.0	98.0	
	phenolic-OH (m · mol/g · L)	0.48	1.04	1.54	2.02	8.83	9.22	
	vanilline (mol%/L)	12.8	13.4	11.2	1.8	+	-	
	syniyor (mol%/L)	30.2	31.6	27.9	4.4	+	-	
	total (mol%/L)	43.0	45.0	39.1	6.2	-	-	
	s/v ratio	2.36	2.35	2.48	2.5	-	-	
	aldehyde on original wood meal	43.0	18.2	9.3	5.8	-	-	