

Supplementary Information

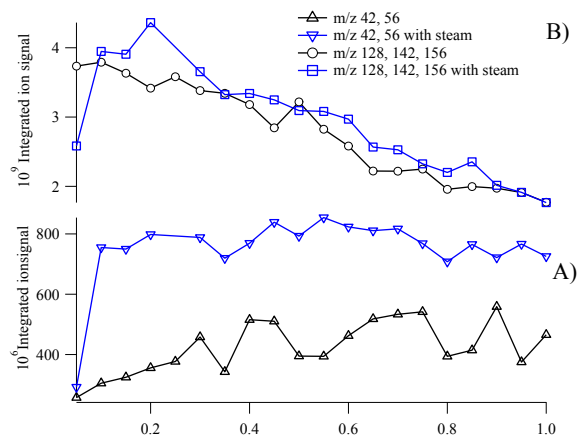


Figure S1. Integrated ion signals (Yields) of selected mass spectral peaks from CFP of 20 samples, each containing 50 mg of pine, and the vapors passed over a fixed bed containing 1.0 g HZSM-5. The pulses in (A) are for olefins, while the pulses in (B) are for naphthalenes.

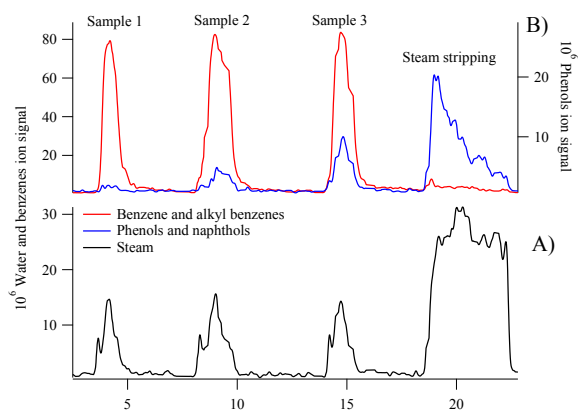


Fig. S2 Ion profiles for CFP of three pine samples followed by steam stripping, A) steam and B) benzenes and phenols and naphthols.

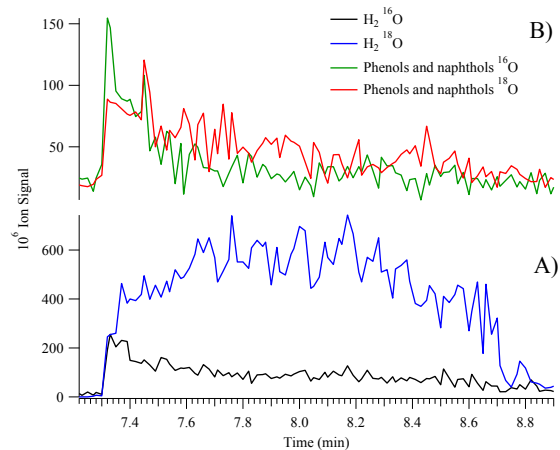


Fig. S3. Ion count profiles recorded when steam (97 % ^{18}O + 3 % ^{16}O) was passed over spent HZSM-5 during CFP of cellulose, A) steam and B) phenol and naphthols.

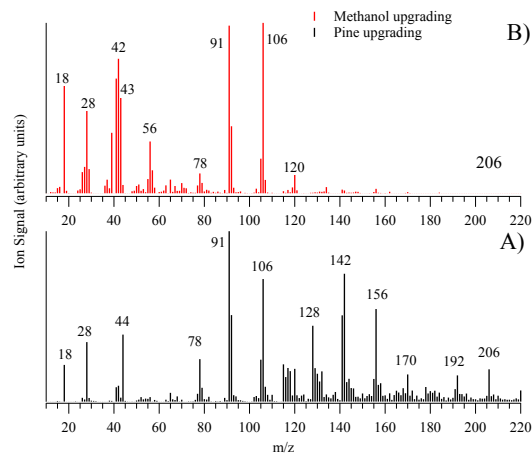


Fig. S4 A). Products observed from passing pine pyrolysis products over a fixed bed of HZSM-5. B) Products observed from upgrading methanol over HZSM-5. The catalytic upgrading temperature for both experiments was 500 °C.

Table S1. Compounds observed by MBMS during vapor phase upgrading of biomass pyrolysis products using HZSM-5 with and without steam (H_2O and H_2^{18}O).

m/z	Compound	GCMS: compound structure	m/z	Compound	GCMS: compound structure
18	Water	$\text{H}-\text{O}-\text{H}$	122,124	Dimethyl phenols	
28	Carbon monoxide	$\text{C}\equiv\text{O}$	128	Naphthalene	
44	Carbon dioxide	$\text{O}=\text{C}=\text{O}$	132	Methyl indane	
78	Benzene		142	Methyl naphthalenes	
91	Toluene		144,146	Naphthols	
94,96	Phenol		156	Dimethyl naphthalenes	
106	Xylenes and ethyl benzene		158,160	Methyl naphthols	
108,110	Methyl phenols		170	Trimethyl naphthalenes	
116	Indene		178	Anthracene	
118	Indane		192	Methyl anthracenes	
120	Trimethyl benzenes and methyl ethyl benzenes		206	Dimethyl anthracenes	