

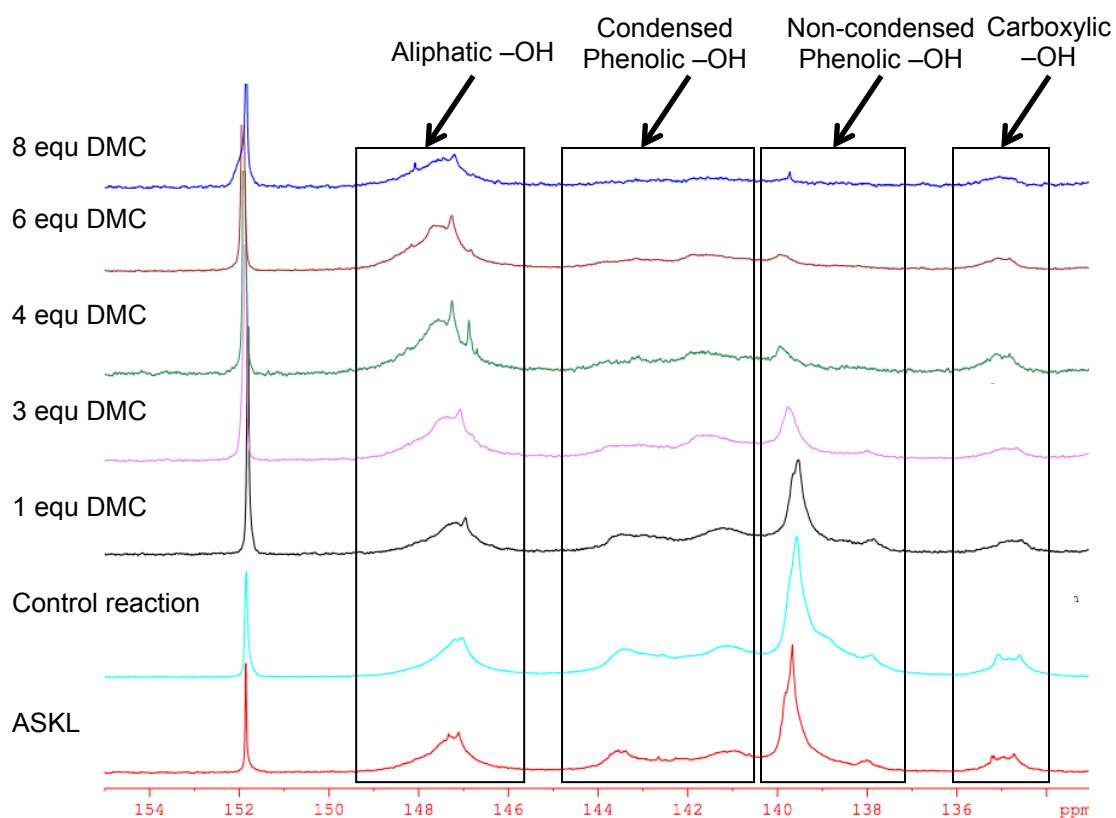
## Supplementary Information For

### Methylation of Softwood Kraft Lignin with Dimethyl Carbonate

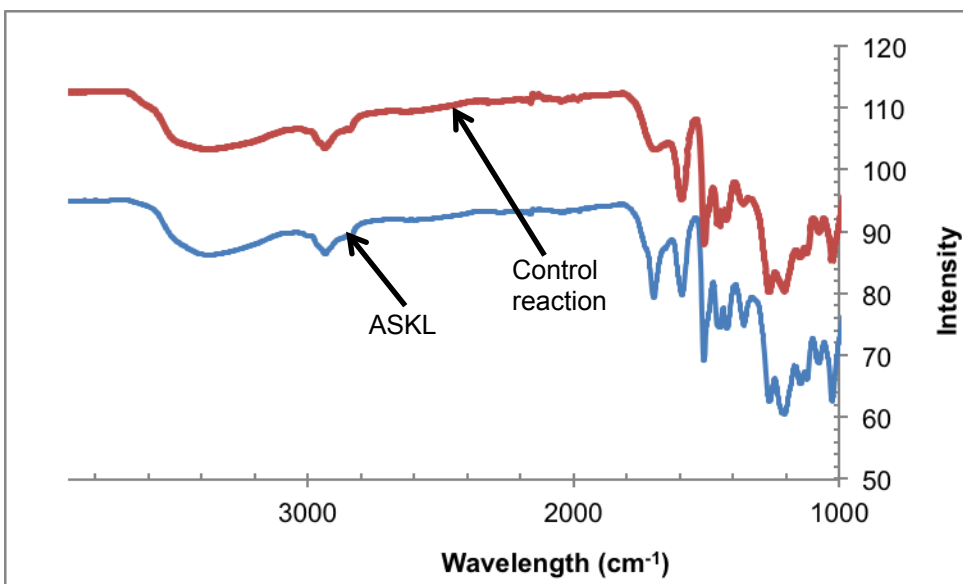
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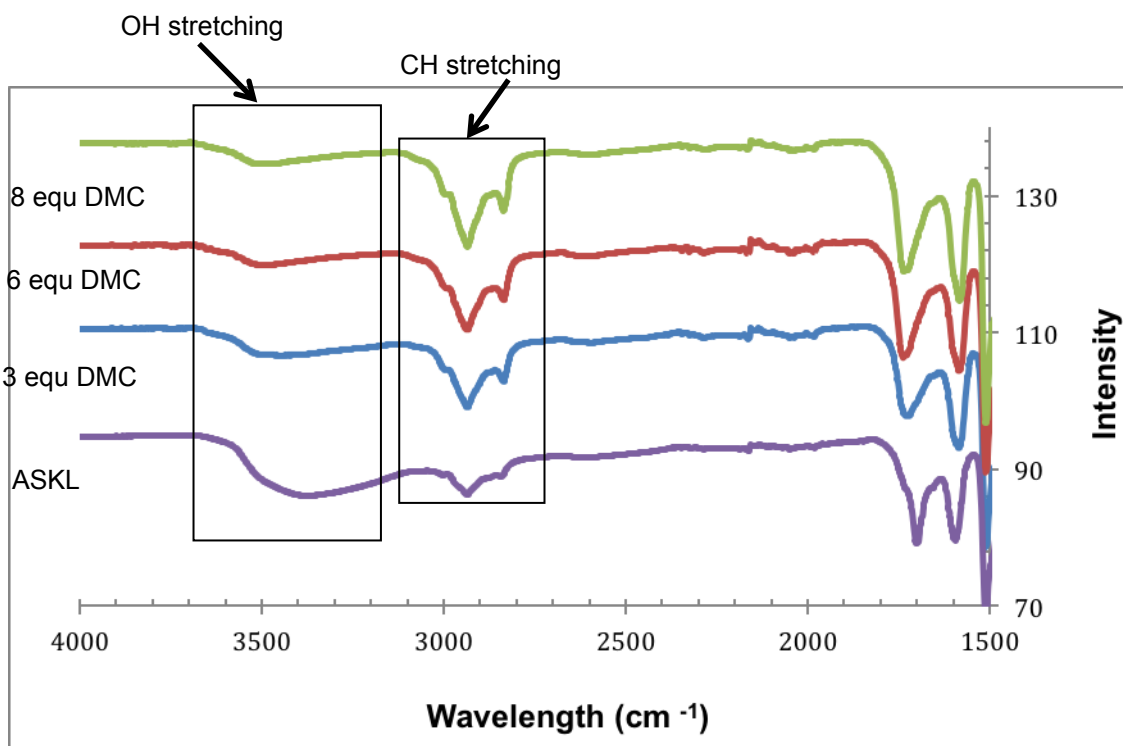
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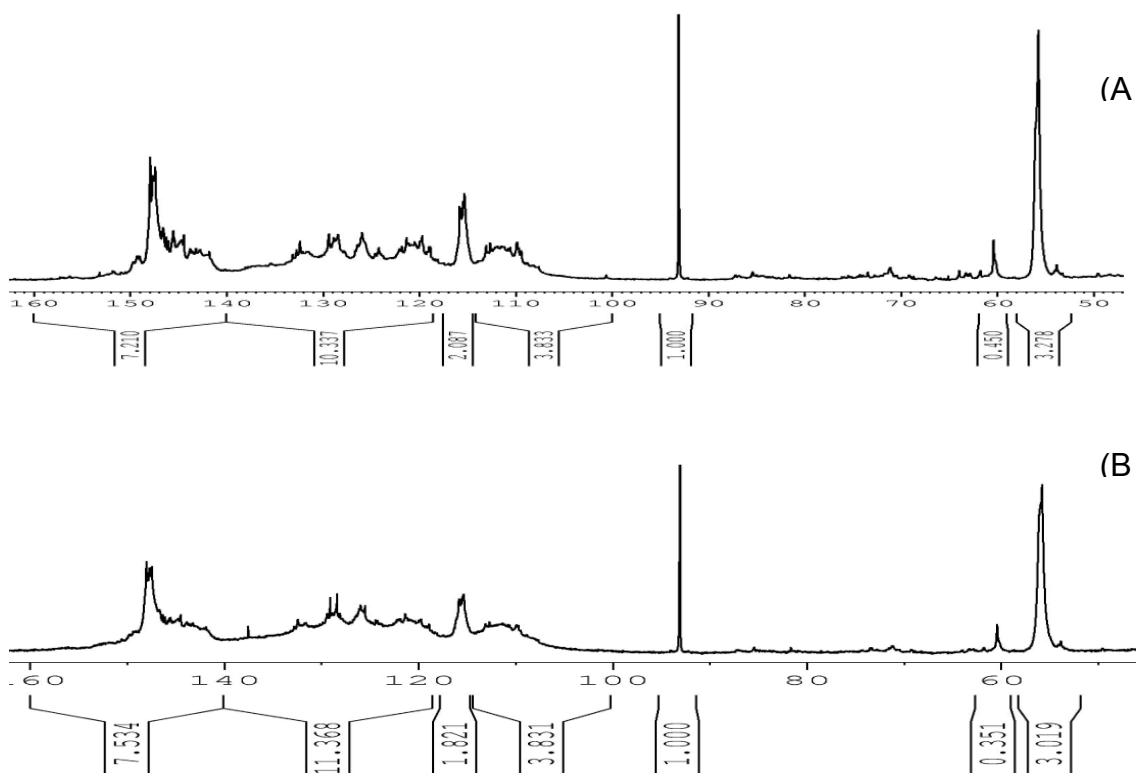
**S1.** Quantitative <sup>13</sup>P NMR spectra data of ASKL, control reaction and methylated samples synthesized using different equivalents of DMC.



**S2:** FT-IR spectra of ASKL and control reaction (Base: NaOH).



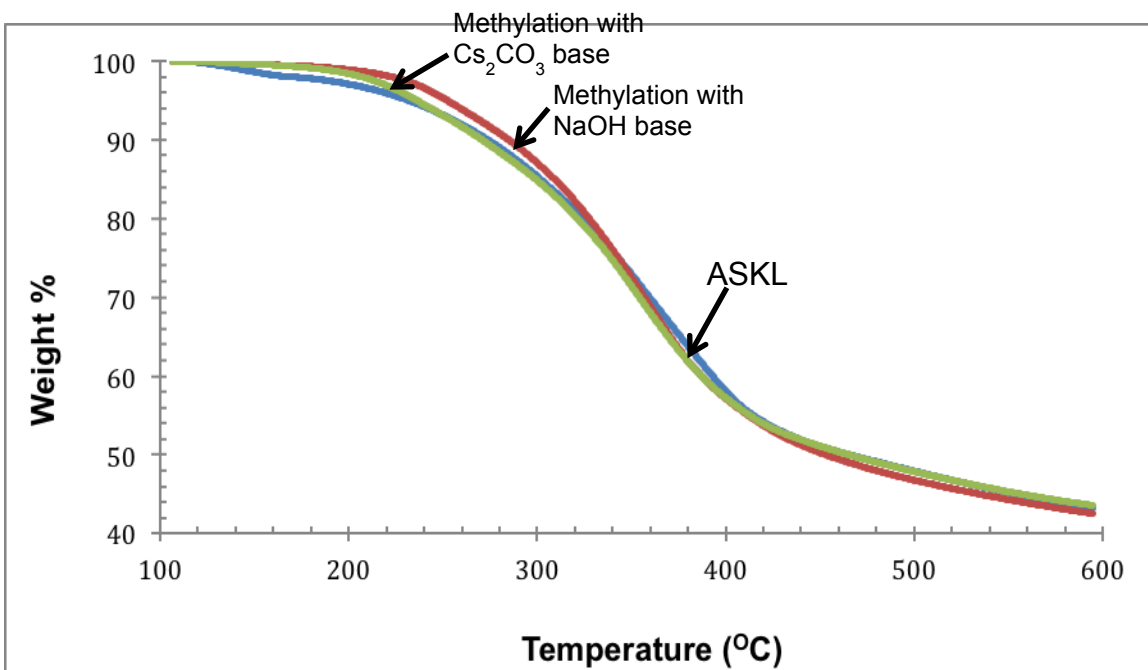
**S3.** Overlay of FT-IR spectra of ASKL and methylated samples using  $\text{Cs}_2\text{CO}_3$  base. Increasing DMC concentration reduces the broad  $-\text{OH}$  stretch ( $3200$  to  $3600$   $\text{cm}^{-1}$ ) and increases the  $\text{C-H}$  stretch ( $2900$  to  $3100$ )  $\text{cm}^{-1}$  as a result of methylation of hydroxyl groups in ASKL.



**S4.** Quantitative  $^{13}\text{C}$  NMR analysis of (A) ASKL (A) and (B) control reaction.

**S5.** Molecular weight distributions and PDI of the methylated lignin samples using NaOH and  $\text{Cs}_2\text{CO}_3$

Base for Methylation	Sample	Mn (g/mol)	Mw (g/mol)	PDI
NaOH	ASKL	1000	3000	3.0
	Control reaction	1000	2800	2.8
	6 equ. DMC	1400	4900	3.5
	8 equ. DMC	1500	4800	3.2
$\text{Cs}_2\text{CO}_3$	ASKL	1000	3000	3.0
	4.5 equ. DMC	1400	4600	3.2
	6 equ. DMC	1400	4700	3.3



S6. TGA traces of ASKL, ASKL methylated in NaOH and ASKL methylated with Cs<sub>2</sub>CO<sub>3</sub>. No significant changes in the thermal stability is observed after methylation.

S7. Molecular weight distributions and PDI of unmethylated and methylated lignin before and after heating 20 °C above respective glass transition temperatures

Sample		Mn (g/mol)	Mw (g/mol)	PDI
ASKL	ASKL	1000	3000	3.0
	1 <sup>st</sup> heating cycle	1400	4000	2.9
	2 <sup>nd</sup> heating cycle	1100	4900	4.5
	3 <sup>rd</sup> heating cycle	1400	5000	3.8
Methylated ASKL	Methylated ASKL	1500	4800	3.2
	1 <sup>st</sup> heating cycle	1300	4800	3.6
	2 <sup>nd</sup> heating cycle	1350	4900	3.0
	3 <sup>rd</sup> heating cycle	1300	4800	3.7