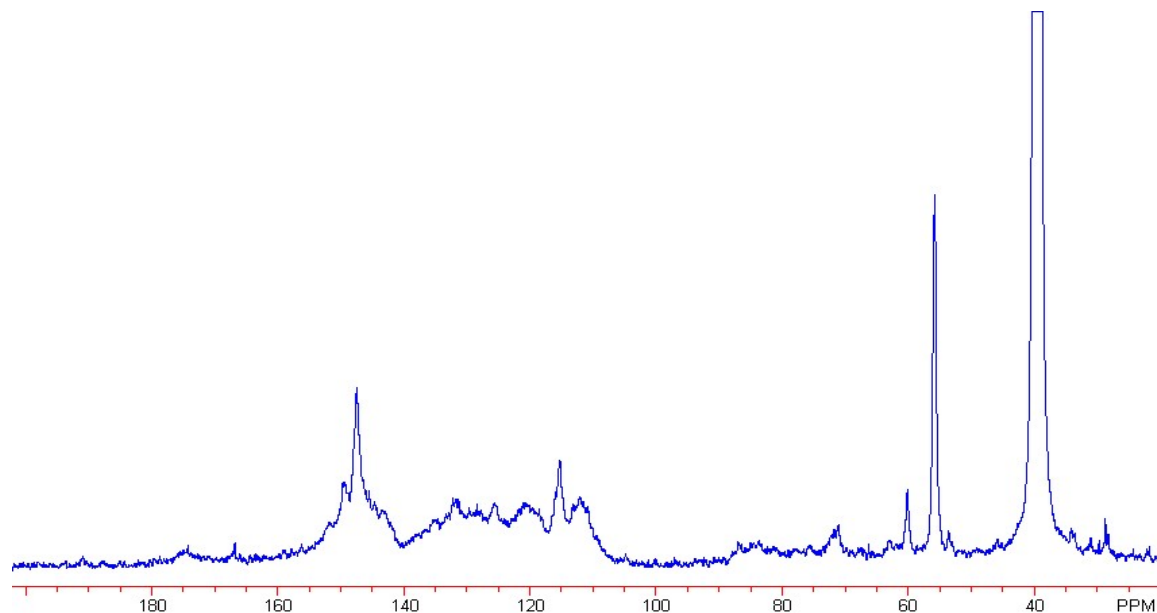


## *<sup>13</sup>C NMR Spectra of Residual Lignin*



<sup>13</sup>C NMR spectrum of residual lignin from SW Kraft Pulp, kappa 30.

Region	Functional group	Integral region/ppm	1 C/C <sub>9</sub>	2 C/C <sub>9</sub>	3 C/C <sub>9</sub>	4 C/C <sub>9</sub>	5 C/C <sub>9</sub>
1	COOH	178-162.5	0.385	0.369	0.455	0.337	0.389
2	C3,C4 (-C-Ar-O)	154.0-140.0	2.058	2.108	2.070	2.096	2.071
3	C1, (-C-Ar-C)	140.0-127.0	1.463	1.410	1.439	1.407	1.442
4	C5, (-C-Ar-C)	127.0-123.0	0.500	0.491	0.504	0.495	0.503
5	C6, (-C-Ar-H)	123.0-117.0	0.778	0.775	0.779	0.791	0.769
6	C5, (-C-Ar-H)	117.0-114.0	0.480	0.488	0.470	0.507	0.482
7	C2, (-C-Ar-H)	114.0-106.0	0.722	0.728	0.738	0.702	0.733
2-4	Substituted aromatic C	154.0-123.0	4.021	4.009	4.013	3.998	4.016
5-7	Unsubstituted aromatic C	123.0-106.0	1.980	1.991	1.987	2.000	1.984
8	Aliphatic C-O (C <sub>β</sub> )	90.0-78.0	0.475	0.471	0.490	0.438	0.454
9	Aliphatic C-O (C <sub>α</sub> )	78.0-67.0	0.533	0.547	0.553	0.495	0.510
10	Aliphatic C-OR	67.0-61.0	0.162	0.160	0.163	0.146	0.139
11	Aliphatic C-O, C <sub>γ</sub>	61.0-57.0	0.277	0.289	0.289	0.277	0.268
12	OCH <sub>3</sub>	57.0-54.0	0.820	0.852	0.804	0.859	0.822
13	C <sub>β</sub> in ββ and C <sub>β</sub> in β5	54.0-52.0	0.108	0.115	0.119	0.111	0.107