

Electronic Supplementary Information

Table S1. SEW fractionation of spruce chips.

Initial [SO ₂] in the liquor, %	Fractionation duration, min	Solid residue properties							pH of the liquid phase (at 0°C) ^d
		Yield, % on wood	Kappa number	Composition, % on wood			Intrinsic viscosity in CED, mL/g	Cellulose DP	
				Lignin	Mannan	Xylan			
	Original wood	(100)	–	27.7	12.8	5.31	–	–	–
3.0	30	80.2	n.d.	19.9	7.13	3.20	n.d.	–	1.23
	60	68.7	n.d.	16.7	5.13	2.72	n.d.	–	1.20
	90	62.1	n.d.	11.6	4.27	2.34	n.d.	–	1.15
	120	61.5	n.d.	10.1	3.98	2.24	n.d.	–	1.14
	146	55.0	68.9	6.61	3.31	1.68	1040 ^a	5000	1.09
	160	56.0	72.4	7.04	n.m.	n.m.	n.m.	–	n.m.
	160	54.2	68.9	6.51	2.98	1.59	1010 ^a	4760	1.10
	180	52.6	57.2	5.30	2.78	1.54	936 ^a	4240	1.06
	200	52.9	58.8	5.47	n.m.	n.m.	n.m.	–	n.m.
	220	50.6	47.2	4.26	2.46	1.28	869 ^a	3740	1.05
	240	50.5	46.8	4.22	n.m.	n.m.	n.m.	–	n.m.
	270	48.4	39.8	3.49	2.28	1.18	774	3140	1.05
	280	50.1	45.4	4.07	n.m.	n.m.	n.m.	–	n.m.
	320	47.5	37.4	3.24	1.95	0.99	628	2450	1.05
370	46.9	32.6	2.82	1.81	0.91	586	2230	1.02	
6.0	30	76.8	n.d.	18.4	5.98	2.87	n.d.	–	1.14
	60	63.8	n.d.	12.1	4.50	2.43	n.d.	–	1.10
	90	55.5	72.8	7.02	3.79	1.89	1140 ^a	5620	1.03
	90 ^b	n.m.	76.7	–	n.m.	n.m.	n.m.	–	n.m.
	100	54.2	58.1	5.54	3.54	1.77	1100 ^a	5260	n.m.
	120	52.5	44.0	4.15	3.36	1.70	1050 ^a	4820	n.m.
	120 ^b	n.m.	49.4	–	n.m.	n.m.	n.m.	–	n.m.
	140	49.9	34.4	3.15	2.97	1.49	937	4010	1.03
	150 ^b	n.m.	33.0	–	n.m.	n.m.	n.m.	–	n.m.
	170	49.1	22.4	2.13	2.62	1.36	829	3440	n.m.
	180 ^b	n.m.	21.2	–	n.m.	n.m.	n.m.	–	n.m.
	200	46.8	20.1	1.84	2.24	1.20	758	2960	0.98
	210 ^b	n.m.	17.4	–	n.m.	n.m.	n.m.	–	n.m.
	240	46.9	19.0	1.77	2.09	1.13	698	2700	1.01
240 ^b	n.m.	15.0	–	n.m.	n.m.	n.m.	–	n.m.	
240 ^b	n.m.	15.3	–	n.m.	n.m.	n.m.	–	n.m.	
12	10	97.2	n.d.	26.80	11.7	5.23	n.d.	–	1.15
	20	80.8	n.d.	20.55	7.66	3.27	n.d.	–	1.17
	40	65.9	n.d.	13.25	4.95	2.59	n.d.	–	1.00
	40	65.0	n.d.	–	n.m.	n.m.	n.d.	–	n.m.
	50	59.9	87.3	9.01	n.m.	n.m.	1130 ^a	6640	n.m.
	60	56.4	64.7	6.59	3.99	2.20	n.m.	–	1.00
	60	56.3	62.5	6.16	n.m.	n.m.	1090 ^a	5930	n.m.
	70	53.6	43.5	4.18	n.m.	n.m.	1090 ^a	5670	n.m.
	80	51.6	33.5	3.30	3.39	1.88	n.m.	–	0.96
	80	51.2	29.4	2.81	n.m.	n.m.	1060	5190	n.m.
	80	51.8	32.2	3.08	n.m.	n.m.	1080	5400	n.m.
	100	48.4	20.2	1.90	2.86	1.67	n.m.	–	0.94
	100	48.4	17.0	1.66	n.m.	n.m.	982	4500	n.m.
	120	47.4	15.3	1.49	2.51	1.49	n.m.	–	0.94

	120	47.9	9.1	1.02	n.m.	n.m.	884	3950	n.m.
	160	46.0	9.3	1.00	n.m.	n.m.	n.m.	–	0.99
18	30	64.2	n.d.	12.2	n.m.	n.m.	n.d.	–	n.m.
	40	55.4	n.d.	8.33	n.m.	n.m.	n.d.	–	n.m.
	50	56.8	66.2	6.56	n.m.	n.m.	1280 ^a	7190	n.m.
	60	53.7	41.4	4.00	n.m.	n.m.	1090	5680	n.m.
	70	51.9	26.5	2.60	n.m.	n.m.	1110	5540	n.m.
	80	50.0	18.9	1.87	n.m.	n.m.	1080	5190	n.m.
	90	49.7	14.6	1.51	n.m.	n.m.	1020	4850	n.m.
	100	47.9	12.9	1.33	n.m.	n.m.	970	4390	n.m.
	110	47.2	11.4	1.19	n.m.	n.m.	905	3990	n.m.
	120	47.2	8.1	0.93	n.m.	n.m.	848	3710	n.m.
	27	30	64.4	n.d.	–	n.m.	n.m.	–	–
40		59.1	78.8	8.06	n.m.	n.m.	961 ^{a,c}	5460 ^c	n.m.
50		52.7	35.5	3.42	n.m.	n.m.	872 ^c	4310 ^c	n.m.
60		51.0	25.7	2.48	n.m.	n.m.	826 ^c	3910 ^c	n.m.
70		49.1	16.8	1.67	n.m.	n.m.	803 ^c	3630 ^c	n.m.
80		48.1	11.5	1.22	n.m.	n.m.	638 ^c	2740 ^c	n.m.

The data for 12% SO₂ was partly published earlier.^{22,24,35}

Lignin content of the defibrated solid residues (pulp) was calculated using formula $[Lig] = 0.165 \times Kappa + 0.63$.³⁵

n.d. – non-defibrated solid residues; n.m. – not measured.

^a The solid residues were delignified with NaClO₂

^b The data provided by Mr. Neraj Najar

^c Air-dried unbleached solid residues prepared at 27% SO₂ were stored at room temperature for 6 weeks before the viscosity measurement which could have affected the results. Other solid residues were analysed within few days.

^d pH of the fresh liquors are: 3.0% SO₂ – 1.23; 6.0% SO₂ – 1.13; 12% SO₂ – 1.00.