

**S1.** Reference values of volatile matter content of training set (numbered as Tr) and test set (numbered as Te)

Sample number	Reference Vad (%)	Sample number	Reference Vad (%)
Tr-1	8.08	Tr-2	8.16
Tr-3	8.16	Tr-4	8.16
Tr-5	8.26	Tr-6	8.3
Tr-7	8.32	Tr-8	8.38
Tr-9	8.44	Tr-10	8.45
Tr-11	8.5	Tr-12	8.55
Tr-13	8.61	Tr-14	8.61
Tr-15	8.62	Tr-16	8.65
Tr-17	8.66	Tr-18	8.7
Tr-19	8.71	Tr-20	8.77
Tr-21	8.85	Tr-22	8.86
Tr-23	8.88	Tr-24	8.9
Tr-25	8.92	Tr-26	8.96
Tr-27	8.97	Tr-28	8.97
Tr-29	9	Tr-30	9.03
Tr-31	9.04	Tr-32	9.08
Tr-33	9.14	Tr-34	9.14
Tr-35	9.14	Tr-36	9.24
Tr-37	9.36	Tr-38	9.42
Tr-39	9.48	Tr-40	9.51
Tr-41	9.58	Tr-42	9.59
Tr-43	9.63	Tr-44	9.7
Tr-45	9.8	Tr-46	9.89
Tr-47	9.96	Tr-48	10.07
Tr-49	10.23	Tr-50	10.53
Tr-51	10.56	Tr-52	10.92
Te-1	7.61	Te-2	8.23
Te-3	8.38	Te-4	8.55
Te-5	8.65	Te-6	8.78
Te-7	8.91	Te-8	8.98
Te-9	9.12	Te-10	9.29
Te-11	9.55	Te-12	9.77
Te-13	10.09	Te-14	11.39

**S2.** The internal water content of training set (numbered as Tr) and test set (numbered as Te)

Sample number	Internal water content (%)	Sample number	Internal water content (%)
Tr-1	0.94	Tr-2	0.82
Tr-3	0.77	Tr-4	0.98
Tr-5	1.02	Tr-6	1.44
Tr-7	0.93	Tr-8	1.14
Tr-9	0.93	Tr-10	0.87
Tr-11	0.96	Tr-12	0.79
Tr-13	1.15	Tr-14	1.34
Tr-15	0.64	Tr-16	0.86
Tr-17	0.90	Tr-18	0.89
Tr-19	0.90	Tr-20	1.08
Tr-21	1.06	Tr-22	0.75
Tr-23	1.30	Tr-24	1.16
Tr-25	0.70	Tr-26	1.06
Tr-27	1.09	Tr-28	0.63
Tr-29	0.89	Tr-30	0.72
Tr-31	0.86	Tr-32	0.95
Tr-33	0.86	Tr-34	0.88
Tr-35	0.74	Tr-36	1.20
Tr-37	0.90	Tr-38	0.98
Tr-39	0.96	Tr-40	0.82
Tr-41	1.02	Tr-42	1.01
Tr-43	1.54	Tr-44	1.14
Tr-45	1.08	Tr-46	0.96
Tr-47	1.06	Tr-48	0.83
Tr-49	1.03	Tr-50	0.85
Tr-51	1.00	Tr-52	0.70
Te-1	0.96	Te-2	0.95
Te-3	0.84	Te-4	1.52
Te-5	0.93	Te-6	0.78
Te-7	0.88	Te-8	1.00
Te-9	0.84	Te-10	0.95
Te-11	1.26	Te-12	1.10
Te-13	0.87	Te-14	1.22

**S3. Air-dry basis ash (Aad) content of training set (numbered as Tr) and test set (numbered as Te)**

Sample number	Aad (%)	Sample number	Aad (%)
Tr-1	23.53	Tr-2	23.59
Tr-3	24.33	Tr-4	22.45
Tr-5	21.91	Tr-6	24.21
Tr-7	23.29	Tr-8	22.38
Tr-9	24.31	Tr-10	23.31
Tr-11	26.31	Tr-12	24.73
Tr-13	25.03	Tr-14	25.75
Tr-15	22.84	Tr-16	23.52
Tr-17	26.99	Tr-18	25.61
Tr-19	25.61	Tr-20	24.93
Tr-21	23.80	Tr-22	25.19
Tr-23	26.58	Tr-24	24.64
Tr-25	25.02	Tr-26	24.70
Tr-27	26.04	Tr-28	22.91
Tr-29	24.71	Tr-30	23.39
Tr-31	24.92	Tr-32	25.30
Tr-33	21.47	Tr-34	25.28
Tr-35	26.07	Tr-36	24.78
Tr-37	26.65	Tr-38	23.62
Tr-39	25.90	Tr-40	25.59
Tr-41	24.19	Tr-42	23.47
Tr-43	23.89	Tr-44	28.11
Tr-45	26.71	Tr-46	28.22
Tr-47	25.73	Tr-48	24.63
Tr-49	23.65	Tr-50	21.99
Tr-51	21.43	Tr-52	24.78
Te-1	24.39	Te-2	22.12
Te-3	22.80	Te-4	24.38
Te-5	32.98	Te-6	27.45
Te-7	25.21	Te-8	22.98
Te-9	24.47	Te-10	25.53
Te-11	25.42	Te-12	23.40
Te-13	27.78	Te-14	28.08

**S4.** Air-dry basis fixed carbon (FCad) content of training set (numbered as Tr) and test set (numbered as Te)

Sample number	FCad (%)	Sample number	FCad (%)
Tr-1	67.45	Tr-2	67.43
Tr-3	66.74	Tr-4	68.41
Tr-5	68.81	Tr-6	66.05
Tr-7	67.46	Tr-8	68.10
Tr-9	66.32	Tr-10	67.37
Tr-11	64.23	Tr-12	65.93
Tr-13	65.21	Tr-14	64.30
Tr-15	67.90	Tr-16	66.97
Tr-17	63.45	Tr-18	64.80
Tr-19	64.78	Tr-20	65.22
Tr-21	66.29	Tr-22	65.20
Tr-23	63.24	Tr-24	65.30
Tr-25	65.36	Tr-26	65.28
Tr-27	63.90	Tr-28	67.49
Tr-29	65.40	Tr-30	66.86
Tr-31	65.18	Tr-32	64.67
Tr-33	68.53	Tr-34	64.70
Tr-35	64.05	Tr-36	64.78
Tr-37	63.09	Tr-38	65.98
Tr-39	63.66	Tr-40	64.08
Tr-41	65.21	Tr-42	65.93
Tr-43	64.94	Tr-44	61.05
Tr-45	62.41	Tr-46	60.93
Tr-47	63.25	Tr-48	64.47
Tr-49	65.09	Tr-50	66.63
Tr-51	67.01	Tr-52	63.60
Te-1	67.04	Te-2	68.70
Te-3	67.98	Te-4	65.55
Te-5	57.44	Te-6	62.99
Te-7	65.00	Te-8	67.04
Te-9	65.57	Te-10	64.23
Te-11	63.77	Te-12	65.73
Te-13	61.26	Te-14	59.31

**S5. Prediction accuracy using different regularization factor without random spectral attenuation**

Regularization factor	R <sup>2</sup> C	Humidified test set		Routine test set	
		R <sup>2</sup> P	RMSEP (%)	R <sup>2</sup> P	RMSEP (%)
2 <sup>-10</sup>	0.9999	-125.0913	9.9827	-1.4931	1.4037
2 <sup>-9</sup>	0.9999	-84.4853	8.2196	-2.5707	1.6799
2 <sup>-8</sup>	0.9998	-17.0269	3.7746	-0.8069	1.1950
2 <sup>-7</sup>	0.9999	-111.9000	9.4461	-0.5126	1.0934
2 <sup>-6</sup>	0.9999	-94.1231	8.6706	-2.3725	1.6326
2 <sup>-5</sup>	0.9998	-9.1963	2.8388	-0.0808	0.9242
2 <sup>-4</sup>	0.9993	-15.8961	3.6543	0.2553	0.7672
2 <sup>-3</sup>	0.9990	-19.0254	3.9783	-0.0415	0.9073
2 <sup>-2</sup>	0.9968	-19.8732	4.0616	0.1366	0.8260
2 <sup>-1</sup>	0.9890	-5.7663	2.3125	0.6078	0.5567
1	0.9586	-3.1446	1.8099	0.7484	0.4459
2 <sup>1</sup>	0.9313	-0.8138	1.1973	0.7748	0.4219
2 <sup>2</sup>	0.8636	-0.5532	1.1079	0.7523	0.4425
<b>2<sup>3</sup></b>	<b>0.7965</b>	<b>0.3517</b>	<b>0.7158</b>	<b>0.6862</b>	<b>0.4980</b>
2 <sup>4</sup>	0.6291	0.2900	0.7491	0.4713	0.6464
2 <sup>5</sup>	0.2402	0.1110	0.8382	0.1375	0.8256
2 <sup>6</sup>	0.0000	-0.0016	0.8897	-0.0016	0.8897
2 <sup>7</sup>	0.0000	-0.0016	0.8897	-0.0016	0.8897
2 <sup>8</sup>	0.0000	-0.0016	0.8897	-0.0016	0.8897
2 <sup>9</sup>	0.0000	-0.0016	0.8897	-0.0016	0.8897
2 <sup>10</sup>	0.0000	-0.0016	0.8897	-0.0016	0.8897