Supporting Information

A Thermal Study on Peat Oxidation Behavior in The Presence of Iron-Based Catalyst

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Table S1. Kinetic parameters of peat oxidation process in the presence and absence of Iron tallates obtained by the model approach of non-isothermal kinetics during experiments.

Multi-step model	Model	Peat oxidation kinetic parameters	Catalytic peat oxidation kinetic parameters
Fn-Fn	Fn	E=80.9 kJ·mole^{-1}, LnA=4.6 s^{-1}, ReactOrder n=1.70	E=65.7 kJ·mole^{-1}, LnA=3.2 s^{-1}, ReactOrder n=1.5
	Fn	E=163.9 kJ·mole^{-1}, LnA=9.9 s^{-1}, ReactOrder n=1.40	E=133.4 kJ·mole^{-1}, LnA=7.7 s^{-1}, ReactOrder n=1.4
	R^2	0.99721	0.99649
	F-test	1.665	1.228
Fn-Bna	Fn	E=76.3 kJ·mole^{-1}, LnA=4.1 s^{-1}, ReactOrder n=1.45	E=63 kJ·mole^{-1}, LnA=2.9 s^{-1}, ReactOrder n=1.4
	Bna	E=132.2 kJ·mole^{-1},	E=125.7 kJ·mole^{-1},

		LnA=7.7 s^{-1}, ReactOrder n=1.46, AutocatOrder 0.254	LnA=7.2 s^{-1}, ReactOrder n=1.49, AutocatOrder 0.152
	R^2	0.99833	0.99659
	F-test	1.000	1.195
Fn-Cnm	Fn	E=78.4 kJ·$mole^{-1}$, LnA=4.3 s^{-1}, ReactOrder n=1.51	E=64.8 kJ·$mole^{-1}$, LnA=3.2 s^{-1}, ReactOrder n=1.16
	Cnm	E=132.2 kJ·$mole^{-1}$, LnA=7.1 s^{-1}, ReactOrder n=1.49, AutocatOrder 0.48, AutocatPower m=0.413	E=110.9 kJ·$mole^{-1}$, LnA=5.7 s^{-1}, ReactOrder n=1.41, AutocatOrder 0.062, AutocatPower m=0.347
	R^2	0.99829	0.99660
	F-test	1.020	1.192
Fn-An	Fn	E=81.3 kJ·$mole^{-1}$, LnA=4.6 s^{-1}, ReactOrder n=1.93	E=67.5 kJ·$mole^{-1}$, LnA=3.9 s^{-1}, ReactOrder n=1.72
	An	E=159.5 kJ·$mole^{-1}$, LnA=9.6 s^{-1}, Dimension n=0.82	E=136.5 kJ·$mole^{-1}$, LnA=7.9 s^{-1}, Dimension n=0.76
	R^2	0.99595	0.99584
	F-test	2.415	1.455
Bna-Fn	Bna	E=82 kJ·$mole^{-1}$, LnA=4.7 s^{-1}, ReactOrder n=1.7, AutocatOrder 0.01	E=66 kJ·$mole^{-1}$, LnA=3.3 s^{-1}, ReactOrder n=1.45, AutocatOrder 0.01
	Fn	E=158.3 kJ·$mole^{-1}$, LnA=9.5 s^{-1},	E=128.5 kJ·$mole^{-1}$, LnA=7.3 s^{-1},

		ReactOrder n=1.4	ReactOrder n=1.39
	R^2	0.99722	0.99648
	F-test	1.660	1.233
Bna-Bna	Bna	E=136.2 kJ·mole^{-1}, LnA=9.5 s^{-1}, ReactOrder n=5.9, AutocatOrder 0.01	E=68.9 kJ·mole^{-1}, LnA=3.6 s^{-1}, ReactOrder n=1.27, AutocatOrder 0.01
	Bna	E=127.1 kJ·mole^{-1}, LnA=7.1 s^{-1}, ReactOrder n=0.58, AutocatOrder 0.01	E=113.3 kJ·mole^{-1}, LnA=6.2 s^{-1}, ReactOrder n=1.3, AutocatOrder 0.013
	R^2	0.96310	0.99619
	F-test	21.665	1.334
Bna-Cnm	Bna	E= 77.9 kJ·mole^{-1}, LnA=4.6 s^{-1}, ReactOrder n=1.53, AutocatOrder 0.01	E=65.5 kJ·mole^{-1}, LnA=3.3 s^{-1}, ReactOrder n=1.22, AutocatOrder 0.01
	Cnm	E= 133.8 kJ·mole^{-1}, LnA=7.2 s^{-1}, ReactOrder n=1.48, AutocatOrder 0.53, AutocatPower m=0.373	E=111.2 kJ·mole^{-1}, LnA=5.9 s^{-1}, ReactOrder n=1.62, AutocatOrder 0.01, AutocatPower m=1.317
	R^2	0.99827	0.99633
	F-test	1.034	1.287
Bna-An	Bna	E=81.3 kJ·mole^{-1}, LnA=4.6 s^{-1}, ReactOrder n=1.93, AutocatOrder 0.01	E=66.8 kJ·mole^{-1}, LnA=3.6 s^{-1}, ReactOrder n=0.84, AutocatOrder 0.01

	An	E=158.3 kJ·mole^{-1}, LnA=9.5 s^{-1}, Dimension n=0.82	E=100.4 kJ·mole^{-1}, LnA=5.2 s^{-1}, Dimension n=0.87
	R^2	0.99598	0.99466
	F-test	2.397	1.868
Cnm-Fn	Cnm	E=82 kJ·mole^{-1}, LnA=4.3 s^{-1}, ReactOrder n=1.67, AutocatOrder 0.04, AutocatPower m=0.01	E=66.3 kJ·mole^{-1}, LnA=3 s^{-1}, ReactOrder n=1.45, AutocatOrder 0.01, AutocatPower m=0.01
	Fn	E=158.5 kJ·mole^{-1}, LnA=9.5 s^{-1}, ReactOrder n=1.39	E=128.4 kJ·mole^{-1}, LnA=7.3 s^{-1}, ReactOrder n=1.39
	R^2	0.99723	0.99650
	F-test	1.656	1.227
Cnm-Bna	Cnm	E=77.6 kJ·mole^{-1}, LnA=4.0 s^{-1}, ReactOrder n=1.3, AutocatOrder 0.01, AutocatPower m=0.01	E=68.4 kJ·mole^{-1}, LnA=3.3 s^{-1}, ReactOrder n=1.28, AutocatOrder 0.01, AutocatPower m=0.01
	Bna	E=126.7 kJ·mole^{-1}, LnA=7.3 s^{-1}, ReactOrder n=1.43, AutocatOrder 0.236	E=115.3 kJ·mole^{-1}, LnA=6.3 s^{-1}, ReactOrder n=1.34, AutocatOrder 0.035
	R^2	0.99819	0.99638
	F-test	1.081	1.271
Cnm-Cnm	Cnm	E=76.3 kJ·mole^{-1}, LnA=3.8 s^{-1}, ReactOrder n=1.38,	E=65.3 kJ·mole^{-1}, LnA=3 s^{-1}, ReactOrder n=0.98,

		AutocatOrder 0.1, AutocatPower m=0.01	AutocatOrder 0.01, AutocatPower m=0.01
	Cnm	E=129.7 kJ·mole^{-1}, LnA=6.9 s^{-1}, ReactOrder n=1.51, AutocatOrder 0.51, AutocatPower m=0.426	E=103.4 kJ·mole^{-1}, LnA=5.4 s^{-1}, ReactOrder n=1.5, AutocatOrder 0.01, AutocatPower m=1.7
	R^2	0.99828	0.99604
	F-test	1.031	1.391
Cnm-An	Cnm	E=82.9 kJ·mole^{-1}, LnA=4.4 s^{-1}, ReactOrder n=1.96, AutocatOrder 0.012, AutocatPower m=0.01	E=66.7 kJ·mole^{-1}, LnA=3.2 s^{-1}, ReactOrder n=0.85, AutocatOrder 0.01, AutocatPower m=0.01
	An	E=157.8 kJ·mole^{-1}, LnA=9.5 s^{-1}, Dimension n=0.82	E=100 kJ·mole^{-1}, LnA=5.1 s^{-1}, Dimension n=88
	R^2	0.99604	0.99478
	F-test	2.366	1.828
An-Fn	An	E=86.9 kJ·mole^{-1}, LnA=4.9 s^{-1}, Dimension n=0.71	E=79.4 kJ·mole^{-1}, LnA=4.4 s^{-1}, Dimension n=0.72
	Fn	E=182 kJ·mole^{-1}, LnA=11.2 s^{-1}, ReactOrder n=1.69	E=139.3 kJ·mole^{-1}, LnA=8.1 s^{-1}, ReactOrder n=1.52
	R^2	0.99503	0.99643
	F-test	2.965	1.248
An-Bna	An	E=83.5 kJ·mole^{-1}, LnA=4.7 s^{-1},	E=75.8 kJ·mole^{-1}, LnA=4.1 s^{-1},

		Dimension n=0.82	Dimension n=0.78
	Bna	E=125.4 kJ·mole^{-1}, LnA=7.2 s^{-1}, ReactOrder n=1.5, AutocatOrder 0.301	E=116 kJ·mole^{-1}, LnA=6.4 s^{-1}, ReactOrder n=1.51, AutocatOrder 0.206
	R^2	0.99822	0.99715
	F-test	1.062	1.000
An-Cnm	An	E=85.1 kJ·mole^{-1}, LnA=4.88 s^{-1}, Dimension n=0.83	E=77.6 kJ·mole^{-1}, LnA=4.1 s^{-1}, Dimension n=0.71
	Cnm	E=124.4 kJ·mole^{-1}, LnA=6.3 s^{-1}, ReactOrder n=1.48, AutocatOrder 0.8, AutocatPower m=0.375	E=124.8 kJ·mole^{-1}, LnA=5.5 s^{-1}, ReactOrder n=1.67, AutocatOrder 1.62, AutocatPower m=0.224
	R^2	0.99824	0.99673
	F-test	1.053	1.146
An-An	An	E=79.3 kJ·mole^{-1}, LnA=4.3 s^{-1}, Dimension n=0.76	E=80.4 kJ·mole^{-1}, LnA=4.7 s^{-1}, Dimension n=0.86
	An	E=174.6 kJ·mole^{-1}, LnA=10.6 s^{-1}, Dimension n=0.72	E=101.8 kJ·mole^{-1}, LnA=5.3 s^{-1}, Dimension n=0.9
	R^2	0.99190	0.99509
	F-test	4.822	1.719
R2-Fn	R2	E=62.5 kJ·mole^{-1}, LnA=2.7 s^{-1}	E=53 kJ·mole^{-1}, LnA=1.9 s^{-1}
	Fn	E=112 kJ·mole^{-1}, LnA=6 s^{-1},	E=90.8 kJ·mole^{-1}, LnA=4.5 s^{-1},

		ReactOrder n=1.12	ReactOrder n=1.14
	R^2	0.99101	0.99104
	F-test	5.348	3.127
R2-Bna	R2	E=48.8 kJ·mole^{-1}, LnA=1.2 s^{-1}	E=46.2 kJ·mole^{-1}, LnA=1.1 s^{-1}
	Bna	E=104.8 kJ·mole^{-1}, LnA=5.8 s^{-1}, ReactOrder n=1.6, AutocatOrder 0.5	E=91.9 kJ·mole^{-1}, LnA=4.8 s^{-1}, ReactOrder n=1.59, AutocatOrder 0.44
	R^2	0.98975	0.98945
	F-test	6.091	3.681
R2-Cnm	R2	E=58.6 kJ·mole^{-1}, LnA=2.3 s^{-1}	E=51.2 kJ·mole^{-1}, LnA=1.7 s^{-1}
	Cnm	E=109 kJ·mole^{-1}, LnA=5.5 s^{-1}, ReactOrder n=1.31, AutocatOrder 0.21, AutocatPower m=0.507	E=94 kJ·mole^{-1}, LnA=4.2 s^{-1}, ReactOrder n=1.3, AutocatOrder 0.42, AutocatPower m=0.252
	R^2	0.99130	0.99055
	F-test	5.177	3.300
R2-An	R2	E=38.1 kJ·mole^{-1}, LnA=0.2 s^{-1}	E=58.4 kJ·mole^{-1}, LnA=2.5 s^{-1}
	An	E=117.2 kJ·mole^{-1}, LnA=6.3 s^{-1}, Dimension n=1.1	E=104.1 kJ·mole^{-1}, LnA=5.5 s^{-1}, Dimension n=0.79
	R^2	0.97573	0.99177
	F-test	14.323	2.873
R2-R2	R2	E=61.3 kJ·mole^{-1},	E=47.6 kJ·mole^{-1},

		LnA=2.6 s^{-1}	LnA=1.4 s^{-1}
	R3	E=68.1 kJ·$mole^{-1}$, LnA=2.3 s^{-1}	E=57 kJ·$mole^{-1}$, LnA=1.4 s^{-1}
	R^2	0.96539	0.96558
	F-test	20.306	11.852
R2-R3	R2	E=61.8 kJ·$mole^{-1}$, LnA=2.67 s^{-1}	E=49.7 kJ·$mole^{-1}$, LnA=1.6 s^{-1}
	R3	E=79.9 kJ·$mole^{-1}$, LnA=3 s^{-1}	E=64.5 kJ·$mole^{-1}$, LnA=1.9 s^{-1}
	R^2	0.97975	0.97990
	F-test	11.968	6.971
R3-Fn	R3	E=69.5 kJ·$mole^{-1}$, LnA=3.2 s^{-1}	E=58.8 kJ·$mole^{-1}$, LnA=2.3 s^{-1}
	Fn	E=119 kJ·$mole^{-1}$, LnA=6.6 s^{-1}, ReactOrder n=1.17	E=97.8 kJ·$mole^{-1}$, LnA=5 s^{-1}, ReactOrder n=1.2
	R^2	0.99432	0.99413
	F-test	3.382	2.053
R3-Bna	R3	E=56.1 kJ·$mole^{-1}$, LnA=1.8 s^{-1}	E=51.4 kJ·$mole^{-1}$, LnA=1.4 s^{-1}
	Bna	E=109.9 kJ·$mole^{-1}$, LnA=6.1 s^{-1}, ReactOrder n=1.55, AutocatOrder 0.439	E=96.8 kJ·$mole^{-1}$, LnA=5.1 s^{-1}, ReactOrder n=1.51, AutocatOrder 0.381
	R^2	0.99452	0.99391
	F-test	3.263	2.131
R3-Cnm	R3	E=64.9 kJ·$mole^{-1}$, LnA=2.7 s^{-1}	E=52.8 kJ·$mole^{-1}$, LnA=1.6 s^{-1}

	Cnm	E=112.8 kJ·mole^{-1}, LnA=5.6 s^{-1}, ReactOrder n=1.34, AutocatOrder 0.51, AutocatPower m=0.36	E=98.3 kJ·mole^{-1}, LnA=3.6 s^{-1}, ReactOrder n=1.51, AutocatOrder 1.46, AutocatPower m=0.367
	R^2	0.99512	0.99419
	F-test	2.911	2.032
R3-An	R3	E=72 kJ·mole^{-1}, LnA=3.4 s^{-1}	E=62.8 kJ·mole^{-1}, LnA=2.7 s^{-1}
	An	E=117.1 kJ·mole^{-1}, LnA=6.4 s^{-1}, Dimension n=0.9	E=101.4 kJ·mole^{-1}, LnA=5.3 s^{-1}, Dimension n=0.83
	R^2	0.99360	0.9940
	F-test	3.81	2.096
R3-R2	R2	E=67.6 kJ·mole^{-1}, LnA=3.1 s^{-1}	E=49.9 kJ·mole^{-1}, LnA=1.5 s^{-1}
	R3	E=70.4 kJ·mole^{-1}, LnA=2.5 s^{-1}	E=62.9 kJ·mole^{-1}, LnA=1.9 s^{-1}
	R^2	0.96777	0.96793
	F-test	18.929	11.056
R3-R3	R2	E=67 kJ·mole^{-1}, LnA=3 s^{-1}	E=53.7 kJ·mole^{-1}, LnA=1.8 s^{-1}
	R3	E=84 kJ·mole^{-1}, LnA=3.3 s^{-1}	E=67.7 kJ·mole^{-1}, LnA=2.1 s^{-1}
	R^2	0.98231	0.98203
	F-test	10.47	6.239
Fn-R2	Fn	E=76.4 kJ·mole^{-1}, LnA=4.4 s^{-1},	E=66.2 kJ·mole^{-1}, LnA=3.2 s^{-1},

		ReactOrder n=0.9	ReactOrder n=2.16
	R2	E=70.4 kJ·mole^{-1}, LnA=2.5 s^{-1}	E=87.6 kJ·mole^{-1}, LnA=3.8 s^{-1}
	R^2	0.96835	0.98715
	F-test	18.602	4.476
Fn-R3	Fn	E=90.2 kJ·mole^{-1}, LnA=5.4 s^{-1}, ReactOrder n=2.6	E=62.5 kJ·mole^{-1}, LnA=3.1 s^{-1}, ReactOrder n=1.12
	R3	E=111.8 kJ·mole^{-1}, LnA=5.5 s^{-1}	E=71.9 kJ·mole^{-1}, LnA=2.4 s^{-1}
	R^2	0.99056	0.98376
	F-test	5.611	5.646
Bna-R2	Bna	E=97.3 kJ·mole^{-1}, LnA=6 s^{-1}, ReactOrder n=4.9, AutocatOrder 0.01	E=70.1 kJ·mole^{-1}, LnA=3.5 s^{-1}, ReactOrder n=2.8, AutocatOrder 0.01
	R2	E=115.1 kJ·mole^{-1}, LnA=5.8 s^{-1}	E=93.9 kJ·mole^{-1}, LnA=4.2 s^{-1}
	R^2	0.94165	0.98984
	F-test	33.849	3.547
Bna-R3	Bna	E=93.4 kJ·mole^{-1}, LnA=5.7 s^{-1}, ReactOrder n=2.9, AutocatOrder 0.01	E=69.2 kJ·mole^{-1}, LnA=3.5 s^{-1}, ReactOrder n=2.22, AutocatOrder 0.01
	R3	E=119.8 kJ·mole^{-1}, LnA=6.1 s^{-1}	E= kJ·mole^{-1}, LnA= s^{-1}
	R^2	0.99004	0.99129
	F-test	5.925	3.042

Cnm-R2	Cnm	E=82.9 kJ·mole^{-1}, LnA=4.7 s^{-1}, ReactOrder n=2.58, AutocatOrder 0.01, AutocatPower m=10	E=66.1 kJ·mole^{-1}, LnA=3.2 s^{-1}, ReactOrder n=2.17, AutocatOrder 0.01, AutocatPower m=10
	R2	E=105.2 kJ·mole^{-1}, LnA=5.1 s^{-1}	E=88.2 kJ·mole^{-1}, LnA=3.8 s^{-1}
	R^2	0.98468	0.98721
	F-test	9.090	4.461
Cnm-R3	Cnm	E=92.2 kJ·mole^{-1}, LnA=5.6 s^{-1}, ReactOrder n=2.6, AutocatOrder 0.01, AutocatPower m=10	E=62 kJ·mole^{-1}, LnA=2.8 s^{-1}, ReactOrder n=1.1, AutocatOrder 0.01, AutocatPower m= 0.01
	R3	E=112.2 kJ·mole^{-1}, LnA=5.5 s^{-1}	E=71.4 kJ·mole^{-1}, LnA=2.4 s^{-1}
	R^2	0.99045	0.98363
	F-test	5.680	5.696
An-R2	An	E=87.1 kJ·mole^{-1}, LnA=5.3 s^{-1}, Dimension n=0.91	E=66.5 kJ·mole^{-1}, LnA=3.3 s^{-1}, Dimension n=0.78
	R2	E=76 kJ·mole^{-1}, LnA=2.9 s^{-1}	E=70.8 kJ·mole^{-1}, LnA=2.5 s^{-1}
	R^2	0.96904	0.97376
	F-test	18.207	9.079
An-R3	An	E=89.9 kJ·mole^{-1}, LnA=5.6 s^{-1}, Dimension n=0.9	E=66.9 kJ·mole^{-1}, LnA=3.5 s^{-1}, Dimension n=0.86
	R3	E=87.5 kJ·mole^{-1},	E=75.1 kJ·mole^{-1},

		LnA=3.6 s^{-1}	LnA=2.7 s^{-1}
	R^2	0.98322	0.98411
	F-test	9.939	5.524