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Swelling, cell wall porosity and chemical modification of wood.

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Swelling, Cell Wall Porosity and Chemical Modification of Wood

A thesis submitted to the University of Wales Bangor for the degree of *Philosophae Doctor* in Wood Chemistry

By

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APPENCICES

APPENDIX 1A

Table 1: *Molecular weight and densities of the anhydrides used in this study (Aldrich, 2001)*

Anhydride	Molecular Weight	Density (g/cm^3)
Acetic	102.1	1.08
Propionic	130.1	1.01
Butyric	158.2	0.96
Valeric	186.3	0.84
Hexanoic	214.3	0.92

Calculations: An example is given with acetic anhydride. The following methodology applies to all anhydrides used in this study.

Acetic Anhydride:

1 mole of Acetic Anhydride = 102.1 g = 102.1 / 1.08 =94.53 cm^3 = 94.53 x 10^{24} Å^3.

1 mole of Acetic Anhydride contains (Avogadro's No of molecules) 6.023 x 10^{23},

Volume per molecule = 94.53 x 10^{24} Å^3 / 6.023 x 10^{23} = 156.9 Å^3.

Volume of sphere: $V = 4/3\ \pi\ (D / 2)^3$, D is the diameter of the molecule.

Thus D= 6.68 Å.

Table 2: *Molar volume, and diameter of the anhydride molecules used in this study.*

Anhydride	Molar Volume (Å^3)	Diameter of the molecule (Å)
Acetic	94.53	6.68
Propionic	128.81	7.42
Butyric	163.59	8.01
Valeric	198.19	8.56
Hexanoic	231.42	9.02

APPENDIX 1

Table 1.1: Scots pine samples modified with acetic anhydride at 60^0C.

Time(sec)	WPG (%)	Std. Dev	mmoles/gm	Std. Dev	[OH]t/[OH]0	ln([OH]t/[OH]o)	14.9-[OH]t
0	0	0	0	0	1	0	14.9
900	1.80	0.30	0.42	0.07	0.9718	-0.02861	14.48
1800	3.00	0.38	0.6982	0.09	0.9531	-0.04801	14.2018
2700	4.93	0.90	1.1467	0.21	0.923	-0.08018	13.7533
3600	11.08	0.60	2.5752	0.14	0.8271	-0.1898	12.3248
4500	12.41	1.07	2.8842	0.25	0.8064	-0.2153	12.0158
5400	14.67	2.88	3.4081	0.67	0.7712	-0.2611	11.4919
6300	13.58	0.94	3.1552	0.22	0.7882	-0.2381	11.7448
7200	13.59	1.07	3.1579	0.25	0.788	-0.2383	11.7421
8100	13.97	1.76	3.2462	0.41	0.7821	-0.2462	11.6538
9000	15.42	0.30	3.583	0.07	0.7595	-0.275	11.317
9900	14.75	0.47	3.4281	0.11	0.7699	-0.2615	11.4719
10800	15.71	0.68	3.6512	0.16	0.7549	-0.2811	11.2488
12600	16.27	0.55	3.7812	0.13	0.7607	-0.2735	11.1188
14400	17.44	0.86	4.0524	0.2	0.7462	-0.2928	10.8476
16200	17.15	0.86	3.9839	0.2	0.728	-0.3175	10.9161
18000	16.64	0.30	3.8657	0.07	0.7326	-0.3114	11.0343
19800	18.18	0.12	4.2249	0.03	0.7405	-0.3005	10.6751
21600	19.32	0.99	4.4901	0.23	0.7164	-0.3336	10.4099
23400	19.57	1.50	4.5464	0.35	0.6986	-0.359	10.3536
25200							

Table 1.2: Scots pine samples modified with acetic anhydride at 70^0C.

Time(sec)	WPG (%)	Std. Dev	mmoles/gm	Std. Dev	[OH]t/[OH]0	ln([OH]t/[OH]o)	14.9-[OH]t
0	0	0	0	0	1	0	14.9
900	2.439	0.12	0.5666	0.03	0.9619	-0.03877	14.3334
1800	5.166	0.30	1.2	0.07	0.9194	-0.08404	13.7
2700	8.256	0.08	1.9179	0.02	0.8712	-0.1378	12.9821
3600	8.866	1.63	2.0596	0.38	0.8617	-0.1491	12.8404
4500	9.281	1.24	2.156	0.29	0.8552	-0.1565	12.744
5400	10.784	1.80	2.505	0.42	0.8318	-0.1845	12.395
6300	10.96	0.55	2.548	0.13	0.8289	-0.1876	12.352
7200	11.67	0.51	2.711	0.12	0.818	-0.2008	12.189
8100	11.26	0.38	2.6178	0.09	0.8243	-0.1932	12.2822
9000	12.31	0.47	2.8608	0.11	0.8079	-0.2123	12.0392
9900	13.49	0.81	3.1351	0.19	0.7895	-0.2363	11.7649
10800	11.86	1.07	2.7567	0.25	0.8149	-0.2047	12.1433
12600	13.46	0.99	3.1283	0.23	0.7818	-0.2464	11.7717
14400	14.53	0.99	3.3766	0.23	0.7727	-0.257	11.5234
16200	15.07	1.85	3.5015	0.43	0.7649	-0.268	11.3985
18000	15.54	0.08	3.6101	0.02	0.7577	-0.2774	11.2899
19800	16.64	0.77	3.8671	0.18	0.7404	-0.3006	11.0329
21600	16.59	0.51	3.8542	0.12	0.7413	-0.2993	11.0458
23400	16.85	1.07	3.9142	0.25	0.7372	-0.3049	10.9858
25200	17.62	1.07	4.0939	0.25	0.7552	-0.3214	10.8061

Table 1.3: Scots pine samples modified with acetic anhydride at 80^0C.

Time(sec)	WPG (%)	Std. Dev	mmoles/gm	Std. Dev	[OH]t/[OH]0	ln([OH]t/[OH]o)	14.9-[OH]t
0	0	0	0	0	1	0	14.9
900	5.237	0.24	1.2167738	0.057972	0.91833733	-0.085198	13.6832262
1800	6.441171305	0.23	1.4962068	0.054741	0.89958344	-0.10583	13.4037932
2700	9.241798974	0.17	2.146759	0.040252	0.85592224	-0.15558	12.753241
3600	9.990847569	0.36	2.320754	0.084473	0.84272	-0.169331	12.579246
4500	10.56157442	0.17	2.453327	0.039985	0.8353472	-0.179912	12.446673
5400	11.26588545	0.29	2.61693	0.068998	0.8243671	-0.193152	12.28307
6300	12.2015343	0.15	2.83427	0.036316	0.80978057	-0.210996	12.06573
7200	12.47845347	0.08	2.898595	0.020428	0.80546345	-0.216339	12.001405
8100	12.7716972	0.311	2.966712	0.073818	0.80089182	-0.2220045	11.933288
9000	12.96592161	0.36	3.011828	0.084585	0.79786392	-0.225837	11.888172
9900	13.39067881	0.17	3.110494	0.041713	0.79124205	-0.234156	11.789506
10800	14.10002669	0.41	3.275267	0.09555	0.78018339	-0.248253	11.624733
12600	14.92827008	0.16	3.467658	0.037864	0.76727127	-0.264919	11.432342
14400	16.07140274	0.101744386	3.733194	0.023634	0.74945006	-0.288417	11.166806
16200	16.54040674	0.339793704	3.842138	0.07893	0.7421384	-0.29824	11.057862
18000	16.82209154	0.170895612	3.90757	0.039697	0.73774695	-0.30416	10.99243
19800	17.71986069	0.094882215	4.116111	0.02204	0.72375093	-0.32331	10.783889
21600	18.13452266	0.162526691	4.212432	0.037753	0.71728645	-0.332285	10.687568
23400	18.88138001	0.18734502	4.385918	0.043518	0.70564309	-0.348652	10.514082
25200	19.7130717	0.353199477	4.57911	0.082044	0.69267679	-0.367217	10.32089

Table 1.4: Scots pine samples modified with acetic anhydride at 90^0C.

Time(sec)	WPG (%)	Std. Dev	mmoles/gm	Std. Dev	[OH]t/[OH]0	ln([OH]t/[OH]o)	14.9-[OH]t
0	0	0	0	0	1	0	14.9
900	7.06364513	0.344400055	1.6408	0.08	0.8898	-0.1166	13.2592
1800	8.176057308	0.301350048	1.8992	0.07	0.8725	-0.1363	13.0008
2700	9.078385453	0.516600083	2.1088	0.12	0.8584	-0.1526	12.7912
3600	10.69456881	0.430500069	2.48422	0.1	0.8332	-0.1824	12.41578
4500	11.81636589	0.731850117	2.7448	0.17	0.8157	-0.2036	12.1552
5400	12.94599807	0.817950131	3.0072	0.19	0.7981	-0.2255	11.8928
6300	13.62446618	1.076250172	3.1648	0.25	0.7875	-0.2389	11.7352
7200	14.23620678	1.205400193	3.3069	0.28	0.778	-0.2512	11.5931
8100	15.24917344	1.033200165	3.5422	0.24	0.7622	-0.2716	11.3578
9000	15.17211393	1.722000276	3.5243	0.4	0.7634	-0.2704	11.3757
9900	16.00297906	2.109450338	3.7173	0.49	0.7505	-0.2877	11.1827
10800	16.71545667	1.291500207	3.8828	0.3	0.7394	-0.3022	11.0172
12600	18.51839096	1.205400193	4.3016	0.28	0.7113	-0.3409	10.5984
14400	17.74262984	0.645750103	4.1214	0.15	0.7233	-0.3238	10.7786
16200	18.60104698	0.301350048	4.3208	0.07	0.71	-0.3424	10.5792
18000	19.49734812	1.162350186	4.529	0.27	0.696	-0.3626	10.371
19800	20.51160628	0.68880011	4.7646	0.16	0.6802	-0.3856	10.1354
21600	20.94511985	0.68880011	4.8653	0.16	0.6734	-0.3954	10.0347
23400	21.06350737	1.076250172	4.8928	0.25	0.6716	-0.3981	10.0072
25200	21.39240942	0.645750103	4.9692	0.15	0.6664	0.-4059	9.9308

Table 1.5: Scots pine samples modified with acetic anhydride at 100^{0}C.

Time(sec)	WPG (%)	Std. Dev	mmoles/gm	Std. Dev	[OH]t/[OH]0	ln([OH]t/[OH]o)	14.9-[OH]t
0	0	0	0	0	1	0	14.9
900	5.271042843	1.420650227	1.2244	0.33	0.9178	-0.08594	13.6756
1800	6.12209843	0.344400055	1.42209	0.08	0.9045	-0.1003	13.47791
2700	7.308169169	0.904050145	1.6976	0.21	0.886	-0.121	13.2024
3600	8.779187905	1.2484502	2.0393	0.29	0.8631	-0.1473	12.8607
4500	11.57743835	0.774900124	2.6893	0.18	0.8195	-0.1991	12.2107
5400	13.83498071	2.109450338	3.2137	0.49	0.7843	-0.243	11.6863
6300	13.39526794	2.539950406	3.11156	0.59	0.7911	-0.2351	11.78844
7200	13.53190867	0.215250034	3.1433	0.05	0.789	-0.2369	11.7567
8100	14.82642237	1.93725031	3.444	0.45	0.7688	-0.2635	11.456
9000	16.34608762	0.904050145	3.797	0.21	0.7451	-0.2943	11.103
9900	17.22770871	2.4969004	4.00179	0.58	0.7314	-0.3139	10.89821
10800	17.12834929	0.645750103	3.97871	0.15	0.7329	-0.3107	10.92129
12600	18.1438559	0.817950131	4.2146	0.19	0.7171	-0.3325	10.6854
14400	18.49299146	1.93725031	4.2957	0.45	0.7116	-0.3408	10.6043
16200	18.60233848	0.861000138	4.3211	0.2	0.7099	-0.3426	10.5789
18000	19.32992664	0.215250034	4.49011	0.05	0.6986	-0.3586	10.40989
19800	20.35016876	0.861000138	4.7271	0.2	0.6827	-0.3818	10.1729
21600	20.26234674	0.215250034	4.7067	0.05	0.6804	-0.3849	10.1933
23400	21.09596708	0.861000138	4.90034	0.2	0.6711	-0.399	9.99966
25200	21.57795495	0.258300041	5.0123	0.06	0.6635	-0.41	9.8877

Table 1.6: Scots pine samples modified with acetic anhydride at 110^0C.

Time(sec)	WPG (%)	Std. Dev	mmoles/gm	Std. Dev	[OH]t/[OH]0	ln([OH]t/[OH]o)	14.9-[OH]t
0	0	0	0	0	1	0	14.9
900	6.246125499	0.990150158	1.4509	0.23	0.9026	-0.1025	13.4491
1800	7.383076181	1.506750241	1.715	0.35	0.8848	-0.1225	13.185
2700	10.23513914	1.37760022	2.3775	0.32	0.8404	-0.1741	12.5225
3600	11.21237429	1.722000276	2.6045	0.4	0.8251	-0.1925	12.2955
4500	11.21323529	1.162350186	2.6047	0.27	0.8251	-0.1923	12.2953
5400	13.47938766	1.291500207	3.1311	0.3	0.7898	-0.2361	11.7689
6300	14.66455435	1.506750241	3.4064	0.35	0.7713	-0.2599	11.4936
7200	14.73644786	0.904050145	3.4231	0.21	0.7702	-0.2611	11.4769
8100	14.70459085	1.2484502	3.4157	0.29	0.7707	-0.2606	11.4843
9000	15.45538297	1.162350186	3.5901	0.27	0.759	-0.2759	11.3099
9900	18.63720898	1.894200303	4.3292	0.44	0.7094	-0.3439	10.5708
10800	17.75683634	1.37760022	4.1247	0.32	0.7231	-0.3244	10.7753
12600	18.7564575	2.281650365	4.3569	0.53	0.7075	-0.3469	10.5431
14400	19.92483469	1.722000276	4.6283	0.4	0.6893	-0.3726	10.2717
16200	22.14406254	1.93725031	5.1438	0.45	0.6547	-0.4242	9.7562
18000	21.38982642	0.602700096	4.9686	0.14	0.6665	-0.4057	9.9314
19800	21.07297837	1.119300179	4.895	0.26	0.6714	-0.3985	10.005
21600	21.68773247	0.861000138	5.0378	0.2	0.6618	-0.4128	9.8622
23400	20.19002273	0.258300041	4.6899	0.06	0.6852	-0.3779	10.2101
25200	23.1337822	1.722000276	5.3737	0.4	0.6393	-0.4473	9.5263

Table 1.7: Scots pine samples modified with acetic anhydride at 120^0C.

Time(sec)	WPG (%)	Std. Dev	mmoles/gm	Std. Dev	[OH]t/[OH]0	ln([OH]t/[OH]o)	14.9-[OH]t
0	0	0	0	0	1	0	14.9
900	8.754950751	0.774900124	2.03367	0.18	0.8635	-0.1468	12.86633
1800	9.544660077	0.258300041	2.21711	0.06	0.8512	-0.1617	12.68289
2700	11.48660284	1.549800248	2.6682	0.36	0.8209	-0.197	12.2318
3600	12.64637002	0.947100152	2.9376	0.22	0.8028	-0.2197	11.9624
4500	14.88109588	1.722000276	3.4567	0.4	0.768	-0.2643	11.4433
5400	13.85349222	1.980300317	3.218	0.46	0.784	-0.2439	11.682
6300	16.8773247	1.37760022	3.9204	0.32	0.7368	-0.3061	10.9796
7200	17.95654532	1.37760022	4.17109	0.32	0.72	-0.3287	10.72891
8100	17.78137485	0.430500069	4.1304	0.1	0.7227	-0.3254	10.7696
9000	16.99097672	0.516600083	3.9468	0.12	0.7351	-0.3087	10.9532
9900	18.25557067	1.592850255	4.24055	0.37	0.7153	-0.3353	10.65945
10800	19.6813869	0.430500069	4.57175	0.1	0.6931	-0.3665	10.32825
12600	20.85299284	0.602700096	4.8439	0.14	0.6748	-0.3932	10.0561
14400	21.80310649	0.731850117	5.0646	0.17	0.6642	-0.4091	9.8354
16200	22.89098016	0.430500069	5.3173	0.1	0.66	-0.4154	9.5827
18000	22.81349015	0.774900124	5.2993	0.18	0.6431	-0.4415	9.6007
19800	23.02142168	0.68880011	5.3476	0.16	0.6443	-0.4396	9.5524
21600	23.68697479	0.68880011	5.5022	0.16	0.641	-0.4446	9.3978
23400	24.03783235	0.430500069	5.5837	0.1	0.6307	-0.4609	9.3163
25200							

Table 1.8: Scots pine samples modified with propionic anhydride at 60^0C.

Time(sec)	WPG (%)	Std. Dev	mmoles/gm	Std. Dev	[OH]t/[OH]0	ln([OH]t/[OH]o)	14.9-[OH]t
0	0	0	0	0	1	0	14.9
900	6.069291257	0.11412008	1.06366757	0.02	0.928	-0.0741027	13.83633243
1800	5.949174284	0.11412008	1.04261659	0.02	0.93	-0.0726255	13.85738341
2700	7.828181839	0.05706004	1.37192018	0.01	0.907	-0.0966455	13.52807982
3600	7.131428042	0.17118012	1.24981129	0.03	0.916	-0.0876615	13.65018871
4500	9.219560124	0.28530019	1.61576479	0.05	0.891	-0.114815	13.28423521
5400	8.962328107	0.28530019	1.57068385	0.05	0.984	-0.1115717	13.32931615
6300	10.2942835	0.34236023	1.80411436	0.06	0.878	-0.1290872	13.09588564
7200	10.73977707	0.22824015	1.88218889	0.04	0.873	-0.1350977	13.01781111
8100	10.57695881	1.14120077	1.85365434	0.2	0.875	-0.1329292	13.04634566
9000	10.87199528	0.05706004	1.90536066	0.01	0.872	-0.1368655	12.99463934
9900	11.28623478	0.05706004	1.97795779	0.01	0.867	-0.1452186	12.92204221
10800	12.3450655	0.57060039	2.16352211	0.1	0.854	-0.1569523	12.73647789
12600	12.9721066	0.51354035	2.27341357	0.09	0.847	-0.1656084	12.62658643
14400	13.35877606	0.45648031	2.34117894	0.08	0.842	-0.1710379	12.55882106
16200	14.85615638	0.39942027	2.60360083	0.07	0.825	-0.1921891	12.29639917
18000	15.62108072	0.28530019	2.73765688	0.05	0.816	-0.2031807	12.16234312
19800	15.71200201	0.34236023	2.7535912	0.06	0.815	-0.2044325	12.1464088
21600	17.01288496	0.11412008	2.98157614	0.02	0.799	-0.2235111	11.91842386
23400	17.46832249	0.28530019	3.06139339	0.05	0.794	-0.230152	11.83860661
25200							

Table 1.9: Scots pine samples modified with propionic anhydride at 70^0C.

Time(sec)	WPG (%)	Std. Dev	mmoles/gm	Std. Dev	[OH]t/[OH]0	ln([OH]t/[OH]o)	14.9-[OH]t
0	0	0	0	0	1	0	14.9
900	6.374449827	0.05706004	1.11714783	0.01	0.928	-0.07445	13.78285217
1800	6.921853881	0.05706004	1.21308258	0.01	0.918	-0.0849422	13.68691742
2700	7.98875495	0.11412008	1.40006126	0.02	0.906	-0.0987455	13.49993874
3600	8.674208634	0.05706004	1.52018976	0.01	0.897	-0.1076211	13.37981024
4500	10.21891358	0.17118012	1.79090548	0.03	0.879	-0.1280945	13.10909452
5400	10.13669794	0.28530019	1.77649686	0.05	0.88	-0.1270103	13.12350314
6300	10.58163551	0.34236023	1.85447395	0.06	0.868	-0.1413891	13.04552605
7200	12.46164584	0.39942027	2.18395328	0.07	0.853	-0.1586019	12.71604672
8100	12.65295828	0.45648031	2.21748155	0.08	0.851	-0.1612282	12.68251845
9000	13.05072432	0.05706004	2.28719164	0.01	0.846	-0.1669331	12.61280836
9900	14.87505968	0.05706004	2.60691371	0.01	0.835	-0.192355	12.29308629
10800	15.03790521	0.22824015	2.63545304	0.04	0.823	-0.1948268	12.26454696
12600	14.56642593	0.22824015	2.55282441	0.04	0.828	-0.1879947	12.34717559
14400	15.21889406	0.17118012	2.66717206	0.03	0.82	-0.1973955	12.23282794
16200	17.12188583	0.45648031	3.00067898	0.08	0.798	-0.2250896	11.89932102
18000	19.032183	0.45648031	3.3354662	0.08	0.776	-0.2535035	11.5645338
19800	16.83049157	0.11412008	2.94961097	0.02	0.802	-0.2207656	11.95038903
21600	17.90606434	0.28530019	3.1381094	0.05	0.789	-0.2366207	11.7618906
23400	20.389427	0.34236023	3.57332864	0.06	0.76	-0.2744194	11.32667136
25200							

Table 1.10: Scots pine samples modified with propionic anhydride at 80^0C.

Time(sec)	WPG (%)	Std. Dev	mmoles/gm	Std. Dev	[OH]t/[OH]0	ln([OH]t/[OH]o)	14.9-[OH]t
0	0	0	0	0	1	0	14.9
900	7.963906558	0.17118012	1.39570648	0.03	0.906	-0.0984378	13.50429352
1800	8.801052073	0.17118012	1.54241958	0.03	0.896	-0.1092955	13.35758042
2700	9.977645189	0.22824015	1.74862223	0.04	0.882	-0.1249094	13.15137777
3600	10.25055274	0.11412008	1.79645037	0.02	0.879	-0.1285333	13.10354963
4500	11.49799537	0.51354035	2.01506968	0.09	0.864	-0.1454363	12.88493032
5400	12.36180099	0.51354035	2.16645507	0.09	0.854	-0.1572324	12.73354493
6300	13.62907762	0.57060039	2.38855037	0.1	0.839	-0.1748069	12.51144963
7200	13.86148425	0.45648031	2.42928056	0.08	0.836	-0.1780719	12.47071944
8100	13.70703801	0.28530019	2.40221324	0.05	0.838	-0.1759315	12.49778676
9000	15.17414279	0.28530019	2.65932922	0.05	0.821	-0.1966777	12.24067078
9900	15.2455815	0.34236023	2.67184914	0.06	0.82	-0.1980827	12.22815086
10800	16.91494711	0.45648031	2.96441214	0.08	0.801	-0.2221875	11.93558786
12600	16.51012416	0.45648031	2.8934653	0.08	0.805	-0.2159666	12.0065347
14400	18.97829824	0.39942027	3.32602268	0.07	0.776	-0.2529533	11.57397732
16200	20.64400567	0.57060039	3.61794457	0.1	0.757	-0.2782931	11.28205543
18000	20.11259829	0.05706004	3.5248133	0.01	0.763	-0.2703827	11.3751867
19800	22.10295936	0.62766042	3.87363204	0.11	0.74	-0.3012248	11.02636796
21600	21.94209736	0.28530019	3.84544033	0.05	0.741	-0.2986662	11.05455967
23400	21.73740291	0.34236023	3.80956681	0.06	0.744	-0.2943216	11.09043319
25200							

Table 1.11: Scots pine samples modified with propionic anhydride at 90^0C.

Time(sec)	WPG (%)	Std. Dev	mmoles/gm	Std. Dev	[OH]t/[OH]0	ln([OH]t/[OH]o)	14.9-[OH]t
0	0	0	0	0	1	0	14.9
900	6.655856985	0.05706004	1.16646556	0.01	0.921	-0.0809929	13.73353444
1800	8.408485512	0.05706004	1.47362072	0.01	0.901	-0.1042851	13.42637928
2700	9.847126114	0.05706004	1.72574824	0.01	0.884	-0.1231783	13.17425176
3600	10.92252622	0.11412008	1.91421641	0.02	0.871	-0.1375758	12.98578359
4500	11.32816717	0.28530019	1.98530661	0.05	0.866	-0.1433176	12.91469339
5400	14.39034196	0.45648031	2.52196499	0.08	0.83	-0.1855663	12.37803501
6300	12.2525471	0.57060039	2.14730789	0.1	0.855	-0.1558381	12.75269211
7200	12.67812084	0.62766042	2.22189139	0.11	0.85	-0.1615241	12.67810861
8100	14.58261831	0.68472046	2.55566219	0.12	0.828	-0.1884987	12.34433781
9000	15.65819565	0.28530019	2.74416142	0.05	0.815	-0.2037784	12.15583858
9900	16.21364077	0.51354035	2.8415054	0.09	0.809	-0.2116801	12.0584946
10800	16.78225235	0.45648031	2.941156854	0.08	0.802	-0.2201405	11.95884315
12600	19.27531006	0.17118012	3.37807519	0.03	0.773	-0.2573385	11.52192481
14400	18.53621281	0.05706004	3.24854544	0.01	0.781	-0.246096	11.65145456
16200	21.58357207	0.57060039	3.78260734	0.1	0.746	-0.2929312	11.11739266
18000	20.15127489	0.57060039	3.53159153	0.1	0.762	-0.2708679	11.36840847
19800	22.86845236	1.19826081	4.00778775	0.21	0.731	-0.3134466	10.89221225
21600	22.19546715	0.62766042	3.8898444	0.11	0.738	-0.3031172	11.0101556
23400	23.50789642	0.85590058	4.11985288	0.15	0.723	-0.3243286	10.78014712
25200							

Table 1.12: Scots pine samples modified with propionic anhydride at 100^0C.

Time(sec)	WPG (%)	Std. Dev	mmoles/gm	Std. Dev	[OH]t/[OH]0	ln([OH]t/[OH]o)	14.9-[OH]t
0	0	0	0	0	1	0	14.9
300	8.047688555	0.11412008	1.41038961	0.02	0.905	0.905	13.48961039
900	9.349254282	0.11412008	1.63849421	0.02	0.89	0.89	13.26150579
1800	10.57853829	0.05706004	1.85393115	0.01	0.875	0.875	13.04606885
2700	12.36396048	0.22824015	2.16683353	0.04	0.854	0.854	12.73316647
3600	13.20364488	0.62766042	2.31399158	0.11	0.844	0.844	12.58600842
4500	14.72773837	0.62766042	2.58109506	0.11	0.826	0.826	12.31890494
5400	14.91030396	0.57060039	2.61309041	0.1	0.824	0.824	12.28690959
6300	16.35737661	0.85590058	2.86669568	0.15	0.807	0.807	12.03330432
7200	16.97384448	0.79884054	2.97473414	0.14	0.8	0.8	11.92526586
8100	17.58517089	0.51354035	3.08187154	0.09	0.793	0.793	11.81812846
9000	18.51750071	0.45648031	3.24526607	0.08	0.782	0.782	11.65473393
9900	19.31056352	0.39942027	3.3842535	0.07	0.772	0.772	11.5157465
10800	19.48852802	0.85590058	3.41544249	0.15	0.77	0.77	11.48455751
12600	19.80392368	0.62766042	3.47071684	0.11	0.767	0.767	11.42928316
14400	20.46922233	0.85590058	3.58731309	0.15	0.759	0.759	11.31268691
16200	22.08279406	0.91296062	3.87009799	0.16	0.74	0.74	11.02990201
18000	23.13168424	0.57060039	4.05392019	0.1	0.727	0.727	10.84607981
19800	23.86818389	0.57060039	4.1829947	0.1	0.719	0.719	10.7170053
21600	24.02227162	0.62766042	4.20999919	0.11	0.717	0.717	10.69000081
23400	26.4680898	0.68472046	4.63863861	0.12	0.688	0.688	10.26136139
25200	26.78081613	0.05706004	4.69344515	0.01	0.685	0.685	10.20655485

Table 1.13: Scots pine samples modified with propionic anhydride at 110^0C.

Time(sec)	WPG (%)	Std. Dev	mmoles/gm	Std. Dev	[OH]t/[OH]0	ln([OH]t/[OH]o)	14.9-[OH]t
0	0	0	0	0	1	0	14.9
900	10.09686712	0.11412008	1.76951635	0.02	0.892	-0.1264553	13.13048365
1800	12.36676732	0.17118012	2.16732544	0.03	0.881	-0.1572396	12.73267456
2700	12.62816843	0.05706004	2.21313703	0.01	0.854	-0.1609238	12.68686297
3600	15.46235949	0.45648031	2.70984035	0.08	0.851	-0.2008953	12.19015965
4500	16.2008826	0.39942027	2.83926948	0.07	0.818	-0.2114645	12.06073052
5400	17.29202226	0.51354035	3.03049607	0.09	0.809	-0.2274519	11.86950393
6300	18.76223498	0.57060039	3.28815673	0.1	0.796	-0.2493807	11.61184327
7200	18.69343108	0.28530019	3.27609857	0.05	0.779	-0.2483815	11.62390143
8100	20.29241495	0.34236023	3.55632689	0.06	0.78	-0.2728304	11.34367311
9000	20.7041352	0.85590058	3.62848251	0.15	0.761	-0.2791862	11.27151749
9900	20.56977764	0.05706004	3.60493581	0.01	0.756	-0.2771771	11.29506419
10800	21.57001575	0.79884054	3.78023154	0.14	0.758	-0.2926934	11.11976846
12600	22.28073813	0.68472046	3.90478848	0.12	0.746	-0.3041084	10.99521152
14400	23.43944458	0.7417805	4.10785642	0.13	0.737	-0.3225613	10.79214358
16200	24.42661617	1.14120077	4.28086219	0.2	0.724	-0.3387311	10.61913781
18000	24.16554156	1.14120077	4.23510782	0.2	0.712	-0.3344146	10.66489218
19800	26.20721655	0.28530019	4.59291953	0.05	0.715	-0.368419	10.30708047
21600	26.52269283	0.51354035	4.64820801	0.09	0.691	-0.3742192	10.25179199
23400	27.28770271	0.57060039	4.78227905	0.1	0.688	-0.3871292	10.11772095
25200	28.58842024	0.05706004	5.010235	0.01	0.679	-0.4100037	9.889765

Table 1.14: Scots pine samples modified with propionic anhydride at 120^{0}C.

Time(sec)	WPG (%)	Std. Dev	mmoles/gm	Std. Dev	[OH]t/[OH]0	ln([OH]t/[OH]o)	14.9-[OH]t
0	0	0	0	0	1	0	14.9
300	7.243692697	0.28530019	1.26948612	0.05	0.914	-0.0891006	13.63051388
900	9.348722654	0.22824015	1.63840104	0.04	0.89	-0.1165062	13.26159896
1800	10.20737062	0.28530019	1.78888253	0.05	0.879	-0.1279453	13.11111747
2700	13.03386005	0.39942027	2.28423611	0.07	0.846	-0.1664905	12.61576389
3600	13.87028519	0.51354035	2.43082296	0.09	0.836	-0.1781207	12.46917704
4500	15.33443488	0.57060039	2.68742105	0.1	0.819	-0.1990941	12.21257895
5400	14.60137532	0.68472046	2.55894943	0.12	0.828	-0.1887815	12.34105057
6300	16.77754596	0.68472046	2.94033204	0.12	0.802	-0.219886	11.95966796
7200	17.3396484	0.28530019	3.03884274	0.05	0.796	-0.2280993	11.86115726
8100	19.03333117	0.17118012	3.33566742	0.03	0.776	-0.2534674	11.56433258
9000	19.06967379	0.11412008	3.34203661	0.02	0.775	-0.2540447	11.55796339
9900	19.66606816	0.7417805	3.44655711	0.13	0.768	-0.2631105	11.45344289
10800	21.93563588	0.85590058	3.84430793	0.15	0.741	-0.2985285	11.05569207
12600	21.89959196	0.68472046	3.83799109	0.12	0.742	-0.2978604	11.06200891
14400	24.07251001	0.57060039	4.21880367	0.1	0.716	-0.3330089	10.68119633
16200	24.33190272	0.57060039	4.26426328	0.1	0.713	-0.3372582	10.63573672
18000	25.34106925	1.14120077	4.44112375	0.2	0.701	-0.3540687	10.45887625
19800	25.32766693	0.28530019	4.43877494	0.05	0.702	-0.3537575	10.46122506
21600	25.79540496	0.45648031	4.5207479	0.08	0.696	-0.3615634	10.3792521
23400	27.07503658	0.51354035	4.74500846	0.09	0.681	-0.3834198	10.15499154
25200							

Table 1.15: Scots pine samples modified with butyric anhydride at 60^0C.

Time(sec)	WPG (%)	Std. Dev	mmoles/gm	Std. Dev	[OH]t/[OH]0	ln([OH]t/[OH]o)	14.9-[OH]t
0	0	0	0	0	1	0	14.9
900	5.455642728	0.85200043	0.7684	0.12	0.948	-0.05295	14.1316
1800	6.301253151	0.07100004	0.8875	0.01	0.94	-0.06143	14.0125
2700	7.078703539	0.92300046	0.997	0.13	0.933	-0.069264	13.903
3600	7.464233732	0.35500018	1.0513	0.05	0.929	-0.07317	13.8487
4500	8.05921403	0.28400014	1.1351	0.04	0.923	-0.07925	13.7649
5400	8.488764244	0.49700025	1.1956	0.07	0.919	-0.08365	13.7044
6300	9.091554546	0.56800028	1.2805	0.08	0.914	-0.0899	13.6195
7200	9.509744755	0.21300011	1.3394	0.03	0.91	-0.0942	13.5606
8100	10.05119103	0.85200043	1.41566	0.12	0.904	-0.0998	13.48434
9000	10.67031134	0.78100039	1.50286	0.11	0.899	-0.10632	13.39714
9900	11.26279953	0.35500018	1.586309	0.05	0.893	-0.11257	13.313691
10800	12.23150982	0.85200043	1.722747	0.12	0.884	-0.122288	13.177253
12600	12.7988214	1.27800064	1.80265	0.18	0.879	-0.12896	13.09735
14400	13.53743477	1.13600057	1.90668	0.16	0.872	-0.13692	12.99332
16200	14.05516703	1.06500053	1.9796	0.15	0.867	-0.14257	12.9204
18000	14.76154638	1.42000071	2.07909	0.2	0.86	-0.15029	12.82091
19800	15.15637758	1.49100075	2.1347	0.21	0.856	-0.15463	12.7653
21600	15.52167276	1.56200078	2.18615	0.22	0.853	-0.15867	12.71385
23400	16.43437822	0.71000036	2.3147	0.1	0.844	0.-16884	12.5853
25200							

Table 1.16: Scots pine samples modified with butyric anhydride at 70^0C.

Time(sec)	WPG (%)	Std. Dev	mmoles/gm	Std. Dev	[OH]t/[OH]0	ln([OH]t/[OH]o)	14.9-[OH]t
0	0	0	0	0	1	0	14.9
900	7.684333842	0.42600021	1.0823	0.06	0.927	-0.07543	13.8177
1800	8.144414072	0.42600021	1.1471	0.06	0.923	-0.08012	13.7529
2700	8.904114452	0.49700025	1.2541	0.07	0.915	-0.08793	13.6459
3600	10.44268522	7.10000355	1.4708	1	0.901	-0.10393	13.4292
4500	11.09162555	0.85200043	1.5622	0.12	0.895	-0.11076	13.3378
5400	11.56661578	0.78100039	1.6291	0.11	0.89	-0.11581	13.2709
6300	12.01036601	0.42600021	1.6916	0.06	0.886	-0.12051	13.2084
7200	12.56700628	0.21300011	1.77	0.03	0.881	-0.1264	13.13
8100	12.94969647	0.35500018	1.8239	0.05	0.877	-0.13058	13.0761
9000	13.70613085	0.35500018	1.93044	0.05	0.87	-0.13876	12.96956
9900	14.61443431	0.49700025	2.05837	0.07	0.861	-0.14867	12.84163
10800	15.6089318	0.63900032	2.19844	0.09	0.852	-0.15964	12.70156
12600	16.37899819	1.49100075	2.3069	0.21	0.845	-0.16821	12.5931
14400	17.03148852	1.34900067	2.3988	0.19	0.839	-0.17555	12.5012
16200	17.5902588	1.27800064	2.4775	0.18	0.833	-0.18185	12.4225
18000	18.05246903	0.56800028	2.5426	0.08	0.829	-0.18712	12.3574
19800	18.51822926	1.42000071	2.6082	0.2	0.82	-0.19734	12.2918
21600	19.68930384	0.35500018	2.77314	0.05	0.813	-0.20594	12.12686
23400	22.17828109	0.49700025	3.1237	0.07	0.79	-0.23259	11.7763
25200							

Table 1.17: Scots pine samples modified with butyric anhydride at 80^0C.

Time(sec)	WPG (%)	Std. Dev	mmoles/gm	Std. Dev	[OH]t/[OH]0	ln([OH]t/[OH]o)	14.9-[OH]t
0	0	0	0	0	1	0	14.9
900	6.482303241	0.14200007	0.913	0.02	0.938	-0.06329	13.987
1800	7.994603997	0.35500018	1.126	0.05	0.924	-0.07863	13.774
2700	8.573964287	0.56800028	1.2076	0.08	0.918	-0.08452	13.6924
3600	9.569384785	0.14200007	1.3478	0.02	0.909	-0.09447	13.5522
4500	10.63580532	0.21300011	1.498	0.03	0.899	-0.10597	13.402
5400	11.37917569	0.85200043	1.6027	0.12	0.892	-0.11381	13.2973
6300	12.1928361	1.06500053	1.7173	0.15	0.884	-0.12246	13.1827
7200	12.89644645	1.49100075	1.8164	0.21	0.878	-0.13002	13.0836
8100	13.53260677	1.56200078	1.906	0.22	0.872	-0.13687	12.994
9000	14.04593702	1.06500053	1.9783	0.15	0.867	-0.14245	12.9217
9900	14.9973375	0.56800028	2.1123	0.08	0.858	-0.15288	12.7877
10800	15.49980475	0.63900032	2.18307	0.09	0.853	-0.15843	12.71693
12600	16.02442401	1.49100075	2.25696	0.21	0.848	-0.16425	12.64304
14400	16.91277646	1.42000071	2.38208	0.2	0.84	-0.17421	12.51792
16200	17.95370798	0.35500018	2.52869	0.05	0.836	-0.18605	12.37131
18000	19.18527459	0.63900032	2.70215	0.09	0.818	-0.20011	12.19785
19800	20.35869218	0.35500018	2.86742	0.05	0.807	-0.21375	12.03258
21600	21.03141752	0.35500018	2.96217	0.05	0.801	-0.22164	11.93783
23400	21.90819695	0.42600021	3.08566	0.06	0.792	-0.23207	11.81434
25200							

Table 1.18: Scots pine samples modified with butyric anhydride at 90^0C.

Time(sec)	WPG (%)	Std. Dev	mmoles/gm	Std. Dev	[OH]t/[OH]0	ln([OH]t/[OH]o)	14.9-[OH]t
0	0	0	0	0	1	0	14.9
900	5.577052789	0.28400014	0.7855	0.04	0.947	-0.05419	14.1145
1800	7.205793603	0.42600021	1.0149	0.06	0.931	-0.07055	13.8851
2700	7.617593809	0.35500018	1.0729	0.05	0.927	-0.07473	13.8271
3600	8.385104193	0.07100004	1.181	0.01	0.92	-0.08259	13.719
4500	9.288934644	0.78100039	1.3083	0.11	0.12	-0.09196	13.5917
5400	10.51226526	0.85200043	1.4806	0.12	0.9	-0.1046	13.4194
6300	11.6028258	1.06500053	1.6342	0.15	0.89	-0.116178	13.2658
7200	12.46831623	0.63900032	1.7561	0.09	0.881	-0.12609	13.1439
8100	12.9988285	1.49100075	1.83082	0.21	0.877	-0.131105	13.06918
9000	13.61596081	1.56200078	1.91774	0.22	0.871	-0.13779	12.98226
9900	14.68202634	0.85200043	2.06789	0.12	0.861	-0.14941	12.83211
10800	15.32464766	1.98800099	2.1584	0.28	0.855	-0.1565	12.7416
12600	16.71624836	2.05900103	2.3544	0.29	0.841	-0.17199	12.5456
14400	17.23163762	0.35500018	2.42699	0.05	0.837	-0.177806	12.47301
16200	18.14484007	0.85200043	2.55561	0.12	0.828	-0.18817	12.34439
18000	18.85604743	1.06500053	2.65578	0.15	0.821	-0.19635	12.24422
19800	19.87434414	0.56800028	2.799202	0.08	0.812	-0.20751	12.100798
21600	20.86030743	0.63900032	2.93807	0.09	0.802	-0.21964	11.96193
23400	21.98303099	0.78100039	3.0962	0.11	0.792	-0.23299	11.8038
25200							

Table 1.19: Scots pine samples modified with butyric anhydride at 100^0C.

Time(sec)	WPG (%)	Std. Dev	mmoles/gm	Std. Dev	[OH]t/[OH]0	ln([OH]t/[OH]o)	14.9-[OH]t
0	0	0	0	0	1	0	14.9
900	7.234193617	0.63900032	1.0189	0.09	0.931	-0.07083	13.8811
1800	7.733891867	0.56800028	1.08928	0.08	0.926	-0.07592	13.81072
2700	8.930384465	0.14200007	1.2578	0.02	0.915	-0.08822	13.6422
3600	9.830664915	1.06500053	1.3846	0.15	0.907	-0.09755	13.5154
4500	11.52685576	0.9940005	1.6235	0.14	0.891	-0.11537	13.2765
5400	12.12396606	0.78100039	1.7076	0.11	0.885	-0.1217	13.1924
6300	12.84248642	1.49100075	1.8088	0.21	0.878	-0.1294	13.0912
7200	14.26035713	1.56200078	2.0085	0.22	0.865	-0.1448	12.8915
8100	14.9969115	1.27800064	2.11224	0.18	0.857	-0.1536	12.78776
9000	15.70040825	0.9940005	2.211324	0.14	0.851	-0.16066	12.688676
9900	16.05964003	1.27800064	2.26192	0.18	0.848	-0.16467	12.63808
10800	17.48347474	0.63900032	2.46246	0.09	0.834	-0.18064	12.43754
12600	17.81816891	0.71000036	2.5096	0.1	0.831	-0.18445	12.3904
14400	18.88004544	0.71000036	2.65916	0.1	0.821	-0.19659	12.24084
16200	20.01576201	1.56200078	2.81912	0.22	0.81	-0.20974	12.08088
18000	42.36607618	1.27800064	5.96705	0.18	0.8	-0.22207	8.93295
19800	21.66424083	0.35500018	3.0513	0.05	0.795	-0.22915	11.8487
21600	21.93503497	0.56800028	3.08944	0.08	0.791	-0.23389	11.81056
23400	22.97972949	1.34900067	3.23658	0.19	0.782	-0.2449	11.66342
25200	23.8020519	1.56200078	3.3524	0.22	0.775	-0.25489	11.5476

Table 1.20: Scots pine samples modified with butyric anhydride at 110^0C.

Time(sec)	WPG (%)	Std. Dev	mmoles/gm	Std. Dev	[OH]t/[OH]0	ln([OH]t/[OH]o)	14.9-[OH]t
0	0	0	0	0	1	0	14.9
900	5.058823529	0.71000036	0.71251	0.1	0.952	-0.047867	14.18749
1800	7.007703504	0.85200043	0.987	0.12	0.933	-0.0686	13.913
2700	9.088714544	0.56800028	1.2801	0.08	0.914	-0.08987	13.6199
3600	11.32308566	0.56800028	1.5948	0.08	0.892	-0.1132	13.3052
4500	12.35187618	0.71000036	1.7397	0.1	0.883	-0.12416	13.1603
5400	13.32386666	0.85200043	1.8766	0.12	0.874	-0.13463	13.0234
6300	15.2025276	0.78100039	2.1412	0.11	0.856	-0.15521	12.7588
7200	15.73786787	2.2010011	2.2166	0.31	0.851	-0.16109	12.6834
8100	16.86932443	1.56200078	2.37596	0.22	0.84	-0.17375	12.52404
9000	17.64322482	1.77500089	2.48496	0.25	0.833	-0.18252	12.41504
9900	18.26170613	2.05900103	2.57207	0.29	0.827	-0.19886	12.32793
10800	19.07543754	1.27800064	2.68668	0.18	0.819	-0.20352	12.21332
12600	19.48056374	1.34900067	2.74374	0.19	0.815	-0.22399	12.15626
14400	21.22780361	0.85200043	2.98983	0.12	0.799	-0.23787	11.91017
16200	22.38893819	1.06500053	3.15337	0.15	0.788	-0.24656	11.74663
18000	23.10632255	0.35500018	3.25441	0.05	0.781	-0.26801	11.64559
19800	24.86158543	0.28400014	3.50163	0.04	0.764	-0.26611	11.39837
21600	24.71511236	0.56800028	3.481	0.08	0.766	-0.28484	11.419
23400	26.24395612	0.9940005	3.69633	0.14	0.752	-0.28631	11.20367
25200	26.33788917	1.56200078	3.70956	0.22	0.751	-0.29412	11.19044

Table 1.21: Scots pine samples modified with butyric anhydride at 120^{0}C.

Time(sec)	WPG (%)	Std. Dev	mmoles/gm	Std. Dev	[OH]t/[OH]0	ln([OH]t/[OH]o)	14.9-[OH]t
0	0	0	0	0	1	0	14.9
900	7.412403706	0.63900032	1.044	0.09	0.929	-0.07271	13.856
1800	8.641414321	0.56800028	1.2171	0.08	0.918	-0.08523	13.6829
2700	11.05754553	0.35500018	1.5574	0.05	0.895	-0.11055	13.3426
3600	12.67705634	0.85200043	1.7855	0.12	0.88	-0.1277	13.1145
4500	13.70726685	0.92300046	1.9306	0.13	0.87	-0.13889	12.9694
5400	14.08711704	1.77500089	1.9841	0.25	0.866	-0.14298	12.9159
6300	15.94021797	1.56200078	2.2451	0.22	0.849	-0.16341	12.6549
7200	16.77801839	1.49100075	2.3631	0.21	0.841	-0.17271	12.5369
8100	17.68568284	1.34900067	2.49094	0.19	0.823	-0.18295	12.40906
9000	17.78373389	0.14200007	2.50475	0.02	0.827	-0.188993	12.39525
9900	19.03411552	0.35500018	2.68086	0.05	0.82	-0.19854	12.21914
10800	20.9925805	0.21300011	2.9567	0.03	0.801	-0.22132	11.9433
12600	23.09070255	0.35500018	3.25221	0.05	0.781	-0.24632	11.64779
14400	25.44115872	0.35500018	3.58326	0.05	0.79	-0.27521	11.31674
16200	25.89626895	0.42600021	3.64736	0.06	0.755	-0.28095	11.25264
18000	26.69601335	1.06500053	3.76	0.15	0.747	-0.29657	11.14
19800	28.46008023	0.85200043	4.00846	0.12	0.73	-0.31346	10.89154
21600	30.17813909	0.78100039	4.25044	0.11	0.714	-0.3359	10.64956
23400	31.74297277	0.78100039	4.470839	0.11	0.699	-0.356774	10.429161
25200							

Table 1.22: Scots pine samples modified with valeric anhydride at 60^0C.

Time(sec)	WPG (%)	Std. Dev	mmoles/gm	Std. Dev	[OH]t/[OH]0	ln([OH]t/[OH]o)	14.9-[OH]t
0	0	0	0	0	1	0	14.9
900	3.593716797	1.02000051	0.42279	0.12	0.971	-0.02879	14.47721
1800	4.530587265	0.93500047	0.53301	0.11	0.964	-0.03643	14.36699
2700	4.376737188	0.68000034	0.51491	0.08	0.965	-0.035171	14.38509
3600	5.494827747	0.76500038	0.64645	0.09	0.956	-0.044361	14.25355
4500	5.693217847	4.67500234	0.66979	0.55	0.955	-0.045955	14.23021
5400	6.030753015	1.95500098	0.7095	0.23	0.952	-0.048789	14.1905
6300	6.65966833	0.93500047	0.78349	0.11	0.947	-0.054018	14.11651
7200	7.275153638	0.76500038	0.8559	0.09	0.942	-0.059162	14.0441
8100	7.742653871	0.68000034	0.9109	0.08	0.938	-0.063087	13.9891
9000	8.390354195	0.85000043	0.9871	0.1	0.933	-0.068549	13.9129
9900	8.665924333	0.08500004	1.01952	0.01	0.931	-0.07088	13.88048
10800	9.078344539	0.25500013	1.06804	0.03	0.928	-0.07438	13.83196
12600	9.70093585	0.42500021	1.141286	0.05	0.923	-0.07969	13.758714
14400	9.988694994	0.42500021	1.17514	0.05	0.921	-0.08215	13.72486
16200	10.69208735	0.68000034	1.257892	0.08	0.915	-0.0882	13.642108
18000	11.58474079	0.76500038	1.36291	0.09	0.908	-0.09592	13.53709
19800	12.11208106	0.85000043	1.42495	0.1	0.904	-0.1005	13.47505
21600	13.3975367	0.93500047	1.57618	0.11	0.894	-0.1118	13.32382
23400	14.92320246	1.02000051	1.75567	0.12	0.883	-0.1238	13.14433
25200							

Table 1.23: Scots pine samples modified with valeric anhydride at 70^0C.

Time(sec)	WPG (%)	Std. Dev	mmoles/gm	Std. Dev	[OH]t/[OH]0	ln([OH]t/[OH]o)	14.9-[OH]t
0	0	0	0	0	1	0	14.9
900	4.37920219	0.68000034	0.5152	0.08	0.965	-0.03519	14.3848
1800	5.232007616	1.87000094	0.61553	0.22	0.958	-0.04219	14.28447
2700	6.09994305	0.51000026	0.71764	0.06	0.951	-0.04939	14.18236
3600	6.694178347	0.17000009	0.78755	0.02	0.947	-0.05433	14.11245
4500	7.402143701	1.02000051	0.87084	0.12	0.941	-0.06025	14.02916
5400	8.012104006	1.27500064	0.9426	0.15	0.936	-0.06535	13.9574
6300	8.677569339	1.53000077	1.02089	0.18	0.931	-0.07099	13.87911
7200	9.612739806	1.87000094	1.13091	0.22	0.924	-0.07893	13.76909
8100	10.17136009	1.87000094	1.19663	0.22	0.919	-0.08372	13.70337
9000	10.73006537	2.12500106	1.26236	0.25	0.915	-0.08852	13.63764
9900	11.11545556	2.46500123	1.3077	0.29	0.912	-0.09187	13.5923
10800	11.50081175	1.02000051	1.353036	0.12	0.909	-0.09519	13.546964
12600	12.66356133	1.27500064	1.48983	0.15	0.9	-0.10534	13.41017
14400	13.37798669	2.21000111	1.57388	0.26	0.894	-0.11163	13.32612
16200	13.85976693	0.93500047	1.63056	0.11	0.89	-0.11589	13.26944
18000	14.76816238	1.02000051	1.73743	0.12	0.883	-0.1239	13.16257
19800	15.45691773	0.68000034	1.81846	0.08	0.877	-0.1301	13.08154
21600	15.92943296	0.76500038	1.87405	0.09	0.874	-0.1344	13.02595
23400	18.08545904	0.42500021	2.1277	0.05	0.857	-0.1541	12.7723
25200							

Table 1.24: Scots pine samples modified with valeric anhydride at 80^0C.

Time(sec)	WPG (%)	Std. Dev	mmoles/gm	Std. Dev	[OH]t/[OH]0	ln([OH]t/[OH]o)	14.9-[OH]t
0	0	0	0	0	1	0	14.9
900	4.58056729	0.42500021	0.53889	0.05	0.963	-0.03685	14.36111
1800	6.083793042	0.51000026	0.71574	0.06	0.951	-0.04922	14.18426
2700	6.895203448	0.5950003	0.8112	0.07	0.945	-0.05598	14.0888
3600	8.321164161	1.02000051	0.97896	0.12	0.934	-0.06796	13.92104
4500	8.687769344	1.27500064	1.02209	0.15	0.931	-0.07106	13.87791
5400	9.396754698	1.44500072	1.1055	0.17	0.925	-0.07709	13.7945
6300	10.30345015	2.21000111	1.21217	0.26	0.918	-0.08485	13.68783
7200	10.92616046	1.87000094	1.28543	0.22	0.913	-0.09022	13.61457
8100	11.38541569	1.78500089	1.33946	0.21	0.91	-0.09419	13.56054
9000	11.84135592	1.27500064	1.3931	0.15	0.906	-0.09816	13.5069
9900	12.50316625	0.68000034	1.47096	0.08	0.901	-0.10395	13.42904
10800	13.37484169	0.76500038	1.57351	0.09	0.894	-0.11161	13.32649
12600	14.22475711	0.42500021	1.6735	0.05	0.887	-0.11914	13.2265
14400	15.28453764	0.34000017	1.79818	0.04	0.879	-0.12861	13.10182
16200	16.15910308	1.27500064	1.90107	0.15	0.892	-0.1365	12.99893
18000	16.72773636	1.44500072	1.967968	0.17	0.867	-0.1416	12.932032
19800	17.14935357	0.93500047	2.01757	0.11	0.864	-0.1455	12.88243
21600	17.90117895	0.93500047	2.10602	0.11	0.858	-0.1523	12.79398
23400	19.89944495	1.87000094	2.34111	0.22	0.842	-0.170952	12.55889
25200							

Table 1.25: Scots pine samples modified with valeric anhydride at 90^0C.

Time(sec)	WPG (%)	Std. Dev	mmoles/gm	Std. Dev	[OH]t/[OH]0	ln([OH]t/[OH]o)	14.9-[OH]t
0	0	0	0	0	1	0	14.9
900	5.893817947	0.68000034	0.69339	0.08	0.953	-0.04768	14.20661
1800	7.105408553	1.02000051	0.83593	0.12	0.943	-0.05778	14.06407
2700	9.412564706	0.93500047	1.10736	0.11	0.925	-0.07727	13.79264
3600	8.514794257	1.27500064	1.00174	0.15	0.932	-0.0696	13.89826
4500	9.944664972	1.87000094	1.16996	0.22	0.921	-0.08184	13.73004
5400	10.53533027	2.12500106	1.23945	0.25	0.916	-0.08689	13.66055
6300	8.827126914	2.46500123	1.038485	0.29	0.907	-0.09756	13.861515
7200	12.28590614	2.63500132	1.4454	0.31	0.902	-0.102	13.4546
8100	13.01775651	0.42500021	1.5315	0.05	0.897	-0.1086	13.3685
9000	13.38750669	0.76500038	1.575	0.09	0.894	-0.1179	13.325
9900	14.46896223	1.02000051	1.70223	0.12	0.885	-0.12131	13.19777
10800	15.77991789	1.10500055	1.85646	0.13	0.875	-0.13307	13.04354
12600	17.61158381	0.68000034	2.07195	0.08	0.86	-0.17975	12.82805
14400	18.03183252	0.5950003	2.121391	0.07	0.857	-0.15362	12.778609
16200	18.91956446	1.87000094	2.22583	0.22	0.85	-0.1618	12.67417
18000	20.10778005	1.02000051	2.36562	0.12	0.841	-0.17289	12.53438
19800	21.30109565	1.27500064	2.50601	0.15	0.831	-0.18418	12.39399
21600	22.67886134	1.87000094	2.6681	0.22	0.82	-0.19731	12.2319
23400	24.37792719	0.85000043	2.86799	0.1	0.807	-0.2138	12.03201
25200							

Table 1.26: Scots pine samples modified with valeric anhydride at 100^0C.

Time(sec)	WPG (%)	Std. Dev	mmoles/gm	Std. Dev	[OH]t/[OH]0	ln([OH]t/[OH]o)	14.9-[OH]t
0	0	0	0	0	1	0	14.9
900	5.230477615	1.02000051	0.61535	0.12	0.958	-0.04219	14.28465
1800	6.527323264	1.27500064	0.76792	0.15	0.948	-0.05291	14.13208
2700	7.782093891	0.68000034	0.91554	0.08	0.938	-0.06341	13.98446
3600	8.382194191	0.42500021	0.98614	0.05	0.933	-0.06847	13.91386
4500	8.849354425	0.51000026	1.0411	0.06	0.93	-0.07245	13.8589
5400	8.610674305	1.87000094	1.01302	0.22	0.924	-0.07891	13.88698
6300	10.35751018	1.78500089	1.21853	0.21	0.918	-0.08533	13.68147
7200	10.84150042	1.27500064	1.27547	0.15	0.904	-0.08949	13.62453
8100	12.38901119	1.44500072	1.45753	0.17	0.902	-0.1029	13.44247
9000	13.08711654	0.42500021	1.53966	0.05	0.896	-0.109862	13.36034
9900	13.72606186	0.68000034	1.61483	0.08	0.891	-0.1147	13.28517
10800	14.32198016	0.76500038	1.684938	0.09	0.886	-0.12	13.215062
12600	15.96428298	0.85000043	1.87815	0.1	0.873	-0.13474	13.02185
14400	16.78597839	0.09350005	1.97482	0.011	0.867	-0.14219	12.92518
16200	18.3950292	1.02000051	2.16412	0.12	0.854	-0.15694	12.73588
18000	19.54235977	1.27500064	2.2991	0.15	0.845	-0.1676	12.6009
19800	20.56805528	1.78500089	2.41977	0.21	0.837	-0.17724	12.48023
21600	21.10925055	0.93500047	2.48344	0.11	0.833	-0.182322	12.41656
23400	22.36002618	1.87000094	2.63059	0.22	0.823	-0.19425	12.26941
25200	25.26558263	1.27500064	2.97242	0.15	0.8	-0.22251	11.92758

Table 1.27: Scots pine samples modified with valeric anhydride at 110^{0}C.

Time(sec)	WPG (%)	Std. Dev	mmoles/gm	Std. Dev	[OH]t/[OH]0	ln([OH]t/[OH]o)	14.9-[OH]t
0	0	0	0	0	1	0	14.9
900	8.945574473	0.76500038	1.05242	0.09	0.929	-0.07325	13.84758
1800	10.85323043	0.68000034	1.27685	0.08	0.914	-0.0896	13.62315
2700	12.24782612	0.85000043	1.44092	0.1	0.903	-0.10172	13.45908
3600	14.36160718	0.93500047	1.6896	0.11	0.886	-0.12039	13.2104
4500	16.29195815	1.87000094	1.9167	0.22	0.871	-0.1377	12.9833
5400	17.13515857	2.04000102	2.0159	0.24	0.864	-0.14537	12.8841
6300	17.98345899	1.27500064	2.1157	0.15	0.858	-0.15316	12.7843
7200	19.55000978	1.44500072	2.3	0.17	0.845	-0.16767	12.6
8100	20.74341037	2.12500106	2.4404	0.25	0.836	-0.17888	12.4596
9000	21.56196078	1.61500081	2.5367	0.19	0.829	-0.186661	12.3633
9900	22.3914762	1.87000094	2.63429	0.22	0.823	-0.1945	12.26571
10800	23.29655665	1.87000094	2.74077	0.22	0.816	-0.20329	12.15923
12600	24.17656209	1.53000077	2.8443	0.18	0.809	-0.21182	12.0557
14400	25.63686282	0.51000026	3.0161	0.06	0.795	-0.22621	11.8839
16200	27.26019363	0.68000034	3.20708	0.08	0.784	-0.24238	11.69292
18000	28.92355946	0.76500038	3.40277	0.09	0.771	-0.25926	11.49723
19800	30.15929008	0.85000043	3.54815	0.1	0.761	-0.27199	11.35185
21600	31.3956157	0.93500047	3.6936	0.11	0.752	-0.28489	11.2064
23400	32.30256615	1.02000051	3.8003	0.12	0.744	-0.29446	11.0997
25200	34.10558705	1.78500089	4.01242	0.21	0.73	-0.31381	10.88758

Table 1.28: Scots pine samples modified with valeric anhydride at 120^{0}C.

Time(sec)	WPG (%)	Std. Dev	mmoles/gm	Std. Dev	[OH]t/[OH]0	ln([OH]t/[OH]o)	14.9-[OH]t
0	0	0	0	0	1	0	14.9
900	10.15138508	0.85000043	1.19428	0.1	0.919	-0.08385	13.70572
1800	10.14875007	1.02000051	1.19397	0.12	0.919	-0.08354	13.70603
2700	12.02733601	0.42500021	1.41498	0.05	0.905	-0.099814	13.48502
3600	13.57892679	0.68000034	1.59752	0.08	0.892	-0.11342	13.30248
4500	14.75337238	1.70000085	1.73569	0.2	0.883	-0.12386	13.16431
5400	14.26487713	1.61500081	1.67822	0.19	0.887	-0.11955	13.22178
6300	16.005933	1.27500064	1.88305	0.15	0.873	-0.13512	13.01695
7200	17.76007888	1.1900006	2.08942	0.14	0.859	-0.151143	12.81058
8100	17.45325423	1.87000094	2.053323	0.22	0.862	-0.14829	12.846677
9000	16.56965328	1.78500089	1.94937	0.21	0.869	-0.14022	12.95063
9900	18.35737418	0.68000034	2.15969	0.08	0.855	-0.15667	12.74031
10800	19.01450951	0.76500038	2.237	0.09	0.849	-0.16276	12.663
12600	19.72510986	1.02000051	2.3206	0.12	0.844	-0.16941	12.5794
14400	21.2049606	2.12500106	2.4947	0.25	0.832	-0.18326	12.4053
16200	22.49135125	1.95500098	2.64604	0.23	0.822	-0.19551	12.25396
18000	23.83987692	0.42500021	2.80469	0.05	0.811	-0.20855	12.09531
19800	24.85664743	1.53000077	2.92431	0.18	0.803	-0.21848	11.97569
21600	25.98621299	1.61500081	3.0572	0.19	0.794	-0.2296	11.8428
23400	27.97455949	1.87000094	3.291123	0.22	0.779	-0.2496	11.608877
25200							

Table 1.29: Scots pine samples modified with hexanoic anhydride at 60^0C.

Time(sec)	WPG (%)	Std. Dev	mmoles/gm	Std. Dev	[OH]t/[OH]0	ln([OH]t/[OH]o)	14.9-[OH]t
0	0	0	0	0	1	0	14.9
900	5.917833901	1.089	0.597761	0.11	0.9598	-0.040946	14.302239
1800	6.281253001	1.188	0.63447	0.12	0.9573	-0.043544	14.26553
2700	6.774570001	0.891	0.6843	0.09	0.954	-0.0470213	14.2157
3600	7.583697001	0.792	0.76603	0.08	0.9485	-0.052788	14.13397
4500	8.248284001	2.079	0.83316	0.21	0.944	-0.057544	14.06684
5400	8.797536001	1.485	0.88864	0.15	0.9403	-0.061498	14.01136
6300	9.410643001	1.386	0.95057	0.14	0.9362	-0.065925	13.94943
7200	9.728631001	3.168	0.98269	0.32	0.9338	-0.06849	13.91731
8100	9.846342001	2.475	0.99458	0.25	0.9332	-0.06909	13.90542
9000	10.355202	0.891	1.04598	0.09	0.9297	-0.07283	13.85402
9900	10.909107	0.99	1.10193	0.1	0.926	-0.07683	13.79807
10800	11.3220657	1.188	1.143643	0.12	0.9232	-0.07988	13.756357
12600	12.454695	1.287	1.25805	0.13	0.9155	-0.08821	13.64195
14400	11.858418	0.396	1.19782	0.04	0.9196	-0.08381	13.70218
16200	13.261842	0.792	1.33958	0.08	0.91	-0.09421	13.56042
18000	13.867425	1.188	1.40075	0.12	0.9059	-0.09874	13.49925
19800	14.746941	1.089	1.48959	0.11	0.9	-0.1053	13.41041
21600	14.873661	1.782	1.50239	0.18	0.8991	-0.1062	13.39761
23400	15.732585	0.792	1.58915	0.08	0.8933	-0.1127	13.31085
25200							

Table 1.30: Scots pine samples modified with hexanoic anhydride at 70^0C.

Time(sec)	WPG (%)	Std. Dev	mmoles/gm	Std. Dev	[OH]t/[OH]0	ln([OH]t/[OH]o)	14.9-[OH]t
0	0	0	0	0	1	0	14.9
900	5.906934001	0.891	0.59666	0.09	0.9599	-0.04087	14.30334
1800	6.559146001	0.792	0.66254	0.08	0.9555	-0.04548	14.23746
2700	7.368075001	0.99	0.74425	0.1	0.95	-0.05124	14.15575
3600	8.939700001	1.485	0.903	0.15	0.9393	-0.06253	13.997
4500	8.816940001	0.396	0.8906	0.04	0.94022	-0.06163	14.0094
5400	10.03959	3.069	1.0141	0.31	0.9319	-0.07049	13.8859
6300	10.39698	1.485	1.0502	0.15	0.9295	-0.07309	13.8498
7200	11.024541	1.782	1.11359	0.18	0.9252	-0.07768	13.78641
8100	11.968209	1.386	1.20891	0.14	0.9188	-0.08462	13.69109
9000	12.402324	1.584	1.25276	0.16	0.9159	-0.08786	13.64724
9900	13.300848	0.891	1.34352	0.09	0.9098	-0.0945	13.55648
10800	13.924746	0.792	1.40654	0.08	0.9056	-0.09917	13.49346
12600	14.678037	2.376	1.48263	0.24	0.9004	-0.10487	13.41737
14400	15.473304	1.98	1.56296	0.2	0.8951	-0.11086	13.33704
16200	16.28847	1.881	1.6453	0.19	0.8895	-0.00701	13.2547
18000	17.09334	1.782	1.7266	0.18	0.8841	-0.12318	13.1734
19800	17.68536	2.178	1.7864	0.22	0.8801	-0.12777	13.1136
21600	18.8892	1.485	1.908	0.15	0.8719	-0.13704	12.992
23400	20.85831	2.97	2.1069	0.3	0.8585	-0.15248	12.7931
25200							

Table 1.31: Scots pine samples modified with hexanoic anhydride at 80^0C.

Time(sec)	WPG (%)	Std. Dev	mmoles/gm	Std. Dev	[OH]t/[OH]0	ln([OH]t/[OH]o)	14.9-[OH]t
0	0	0	0	0	1	0	14.9
900	6.602032801	1.089	0.666872	0.11	0.9552	-0.04579	14.233128
1800	8.387794801	0.495	0.847252	0.05	0.9431	-0.05854	14.052748
2700	9.062232301	0.891	0.915377	0.09	0.9385	-0.0634	13.984623
3600	9.980546401	1.188	1.008136	0.12	0.9323	-0.07007	13.891864
4500	11.1127005	1.188	1.122495	0.12	0.9246	-0.07834	13.777505
5400	11.915838	0.99	1.20362	0.1	0.9192	-0.08423	13.69638
6300	12.507957	0.594	1.26343	0.06	0.9152	-0.08861	13.63657
7200	12.98088	1.485	1.3112	0.15	0.9119	-0.09212	13.5888
8100	13.791195	0.594	1.39305	0.06	0.9065	-0.09817	13.50695
9000	14.94504	1.98	1.5096	0.2	0.8986	-0.10682	13.3904
9900	15.558147	2.079	1.57153	0.21	0.8945	-0.11146	13.32847
10800	16.387767	1.881	1.65533	0.19	0.8889	-0.11776	13.24467
12600	17.026713	1.287	1.71987	0.13	0.8845	-0.12265	13.18013
14400	17.74971	0.495	1.7929	0.05	0.8796	-0.12821	13.1071
16200	18.52884	0.792	1.8716	0.08	0.8743	-0.13423	13.0284
18000	19.237284	0.891	1.94316	0.09	0.8695	-0.13974	12.95684
19800	19.806732	2.178	2.00068	0.22	0.8657	-0.14419	12.89932
21600	21.00186	1.188	2.1214	0.12	0.8576	-0.15359	12.7786
23400	22.4532	1.386	2.268	0.14	0.8477	-0.16513	12.632
25200							

Table 1.32: Scots pine samples modified with hexanoic anhydride at 90^0C.

Time(sec)	WPG (%)	Std. Dev	mmoles/gm	Std. Dev	[OH]t/[OH]0	ln([OH]t/[OH]o)	14.9-[OH]t
0	0	0	0	0	1	0	14.9
900	7.714386901	0.891	0.779231	0.09	0.9477	-0.05371	14.120769
1800	8.877726001	0.99	0.89674	0.1	0.9398	-0.06207	14.00326
2700	9.444699001	1.089	0.95401	0.11	0.9359	-0.06618	13.94599
3600	10.232937	0.495	1.03363	0.05	0.93062	-0.07189	13.86637
4500	11.215314	0.891	1.13286	0.09	0.9239	-0.07907	13.76714
5400	12.030381	0.792	1.21519	0.08	0.9184	-0.08507	13.68481
6300	12.8205	0.594	1.295	0.06	0.913	-0.09093	13.605
7200	13.64814	1.485	1.3786	0.15	0.9074	-0.09709	13.5214
8100	14.244912	1.287	1.43888	0.13	0.9034	-0.10156	13.46112
9000	15.764859	0.198	1.59241	0.02	0.8931	-0.11302	13.30759
9900	16.544088	1.485	1.67112	0.15	0.8878	-0.11896	13.22888
10800	17.6696388	1.98	1.784812	0.2	0.8802	-0.12759	13.115188
12600	18.154422	2.079	1.83378	0.21	0.8769	-0.13134	13.06622
14400	19.311633	0.495	1.95067	0.05	0.869	-0.14031	12.94933
16200	20.14551	2.178	2.0349	0.22	0.8634	-0.14684	12.8651
18000	21.370437	1.485	2.15863	0.15	0.8551	-0.1565	12.74137
19800	21.889197	1.584	2.21103	0.16	0.8516	-0.1606	12.68897
21600	22.705056	3.267	2.29344	0.33	0.846	-0.16714	12.60656
23400	23.6511	2.178	2.389	0.22	0.8396	-0.17475	12.511
25200							

Table 1.33: Scots pine samples modified with hexanoic anhydride at 100^0C.

Time(sec)	WPG (%)	Std. Dev	mmoles/gm	Std. Dev	[OH]t/[OH]0	ln([OH]t/[OH]o)	14.9-[OH]t
0	0	0	0	0	1	0	14.9
900	6.931386001	0.495	0.70014	0.05	0.953	-0.04813	14.19986
1800	8.235414001	1.485	0.83186	0.15	0.9441	-0.05746	14.06814
2700	8.531849701	1.188	0.861803	0.12	0.9421	-0.05959	14.038197
3600	9.626760001	1.386	0.9724	0.14	0.9347	-0.06749	13.9276
4500	11.207493	1.584	1.13207	0.16	0.924	-0.07902	13.76793
5400	12.160863	1.98	1.22837	0.2	0.9175	-0.08604	13.67163
6300	12.424896	2.079	1.25504	0.21	0.9157	-0.088012	13.64496
7200	13.648239	2.178	1.37861	0.22	0.9074	-0.097095	13.52139
8100	14.22531	0.792	1.4369	0.08	0.9035	-0.10142	13.4631
9000	14.9208543	0.693	1.507157	0.07	0.8981	-0.107396	13.392843
9900	15.538842	1.089	1.56958	0.11	0.8946	-0.11131	13.33042
10800	15.83703	1.188	1.5997	0.12	0.8926	-0.113601	13.3003
12600	18.180459	1.485	1.83641	0.15	0.8769	-0.13154	13.06359
14400	18.883161	1.584	1.90739	0.16	0.8719	-0.13699	12.99261
16200	20.159766	1.782	2.03634	0.18	0.8633	-0.14699	12.86366
18000	21.11967	0.891	2.1333	0.09	0.8568	-0.15456	12.7667
19800	21.924738	1.98	2.21462	0.2	0.8513	-0.16092	12.68538
21600	23.435775	2.178	2.36725	0.22	0.8411	-0.17304	12.53275
23400	23.843358	2.376	2.40842	0.24	0.8383	-0.17631	12.49158
25200	26.691687	1.089	2.69613	0.11	0.819	-0.19967	12.20387

Table 1.34: Scots pine samples modified with hexanoic anhydride at 110^0C.

Time(sec)	WPG (%)	Std. Dev	mmoles/gm	Std. Dev	[OH]t/[OH]0	ln([OH]t/[OH]o)	14.9-[OH]t
0	0	0	0	0	1	0	14.9
900	8.282439001	0.99	0.83661	0.1	0.943	-0.05863	14.06339
1800	10.1683098	1.188	1.027102	0.12	0.931	-0.07142	13.872898
2700	11.6631405	0.693	1.178095	0.07	0.9209	-0.08237	13.721905
3600	12.6686538	0.792	1.279662	0.08	0.9141	-0.0898	13.620338
4500	13.646457	0.594	1.37843	0.06	0.9074	-0.09709	13.52157
5400	15.111657	0.891	1.52643	0.09	0.8975	-0.10808	13.37357
6300	16.427961	1.98	1.65939	0.2	0.8886	-0.11807	13.24061
7200	17.441523	2.079	1.76177	0.21	0.8817	-0.12583	13.13823
8100	18.161649	1.287	1.83451	0.13	0.8768	-0.13138	13.06549
9000	18.793467	1.485	1.89833	0.15	0.8725	-0.13629	13.00167
9900	19.738422	1.089	1.99378	0.11	0.8661	-0.14366	12.90622
10800	20.827224	2.178	2.10376	0.22	0.8569	-0.15433	12.79624
12600	21.91464	1.485	2.2136	0.15	0.8514	-0.16084	12.6864
14400	24.46389	1.881	2.4711	0.19	0.8341	-0.18134	12.4289
16200	26.430129	0.891	2.66971	0.09	0.8208	-0.1974	12.23029
18000	27.270243	0.792	2.75457	0.08	0.8151	-0.2044	12.14543
19800	29.26341	0.99	2.9559	0.1	0.8016	-0.2211	11.9441
21600	31.7335986	1.188	3.205414	0.12	0.7848	-0.2422	11.694586
23400	32.819688	2.079	3.31512	0.21	0.7775	-0.2516	11.58488
25200	34.407054	1.287	3.47546	0.13	0.7667	-0.2656	11.42454

Table 1.35: Scots pine samples modified with hexanoic anhydride at 120^0C.

Time(sec)	WPG (%)	Std. Dev	mmoles/gm	Std. Dev	[OH]t/[OH]0	ln([OH]t/[OH]o)	14.9-[OH]t
0	0	0	0	0	1	0	14.9
900	6.803775001	0.891	0.68725	0.09	0.9538	-0.047232	14.21275
1800	8.949402001	0.792	0.90398	0.08	0.9393	-0.062619	13.99602
2700	11.397771	1.089	1.15129	0.11	0.9227	-0.080428	13.74871
3600	12.358863	1.485	1.24837	0.15	0.9162	-0.087506	13.65163
4500	13.0737618	2.178	1.320582	0.22	0.9113	-0.092816	13.579418
5400	14.043942	2.475	1.41858	0.25	0.9047	-0.10006	13.48142
6300	15.516567	1.881	1.56733	0.19	0.8942	-0.11182	13.33267
7200	17.055324	0.594	1.72276	0.06	0.8843	-0.12287	13.17724
8100	18.208674	0.198	1.83926	0.02	0.8765	-0.13178	13.06074
9000	19.4120388	1.485	1.960812	0.15	0.8684	-0.14115	12.939188
9900	19.6366896	0.594	1.983504	0.06	0.8668	-0.14281	12.916496
10800	22.903551	1.485	2.31349	0.15	0.8447	-0.16874	12.58651
12600	24.4537227	0.792	2.470073	0.08	0.8341	-0.18132	12.429927
14400	25.15689	1.881	2.5411	0.19	0.8294	-0.18698	12.3589
16200	25.9677	0.891	2.623	0.09	0.8239	-0.19367	12.277
18000	28.675152	1.98	2.89648	0.2	0.8056	-0.21618	12.00352
19800	30.857904	0.891	3.11696	0.09	0.7968	-0.23471	11.78304
21600	32.304888	1.089	3.26312	0.11	0.7809	-0.24718	11.63688
23400	34.103421	1.782	3.44479	0.18	0.7688	-0.26293	11.45521
25200							

Table 1.36: Corsican pine samples modified with acetic anhydride at 60^0C.

Time(sec)	WPG (%)	Std. Dev	mmoles/gm	Std. Dev	[OH]t/[OH]0	ln([OH]t/[OH]o)	14.9-[OH]t
0	0	0	0	0	1	0	14.9
900	1.857177297	0.51660008	0.4314	0.12	0.971	-0.02949	14.4686
1800	3.550334068	0.6457501	0.8247	0.15	0.9446	-0.05696	14.0753
2700	5.160662626	0.38745006	1.19876	0.09	0.9195	-0.08388	13.70124
3600	10.84141238	0.21525003	2.51833	0.05	0.8309	-0.10852	12.38167
4500	10.54032064	0.34440006	2.44839	0.08	0.8356	-0.1796	12.45161
5400	11.94504236	0.51660008	2.77469	0.12	0.8137	-0.2061	12.12531
6300	13.17287161	0.6457501	3.0599	0.15	0.7646	-0.2298	11.8401
7200	12.36654498	0.94710015	2.8726	0.22	0.8072	-0.2124	12.0274
8100	14.18282477	0.90405014	3.2945	0.21	0.7788	-0.2501	11.6055
9000	13.59605318	0.6457501	3.1582	0.15	0.788	-0.2382	11.7418
9900	13.48756716	0.25830004	3.133	0.06	0.7897	-0.2361	11.767
10800	13.36056964	0.77490012	3.1035	0.18	0.7917	-0.2336	11.7965
12600	13.52502066	0.94710015	3.1417	0.22	0.7887	-0.2373	11.7583
14400	14.71492285	0.34440006	3.4181	0.08	0.7705	-0.2608	11.4819
16200	15.51350048	0.38745006	3.6036	0.09	0.7518	-0.2772	11.2964
18000	16.03957157	0.43050007	3.7258	0.1	0.7499	-0.2879	11.1742
19800	16.29270561	0.47355008	3.7846	0.11	0.7459	-0.2933	11.1154
21600	16.82480369	0.6457501	3.9082	0.15	0.7376	-0.3043	10.9918
23400	17.15456674	0.12915002	3.9848	0.03	0.7325	-0.3113	10.9152
25200							

Table 1.37: Corsican pine samples modified with acetic anhydride at 70^0C.

Time(sec)	WPG (%)	Std. Dev	mmoles/gm	Std. Dev	[OH]t/[OH]0	ln([OH]t/[OH]o)	14.9-[OH]t
0	0	0	0	0	1	0	14.9
900	4.290794187	0.38745006	0.9967	0.09	0.9331	-0.06925	13.9033
1800	6.045081967	0.43050007	1.4042	0.1	0.9057	-0.09912	13.4958
2700	7.717574735	0.51660008	1.7927	0.12	0.8796	-0.1282	13.1073
3600	9.078385453	0.21525003	2.1088	0.05	0.8584	-0.1526	12.7912
4500	9.722413556	0.90405014	2.2584	0.21	0.8484	-0.1644	12.6416
5400	10.25502824	0.6457501	2.38212	0.15	0.8401	-0.1742	12.51788
6300	10.23987464	0.68880011	2.3786	0.16	0.8403	-0.174	12.5214
7200	11.68161937	0.94710015	2.7135	0.22	0.8178	-0.2012	12.1865
8100	12.58696101	1.33455021	2.9238	0.31	0.8037	-0.2185	11.9762
9000	12.91155807	0.21525003	2.9992	0.05	0.7987	-0.2252	11.9008
9900	13.7699752	0.43050007	3.1986	0.1	0.7853	-0.2418	11.7014
10800	13.58141617	0.51660008	3.1548	0.12	0.7882	-0.238	11.7452
12600	15.31288745	0.6457501	3.557	0.15	0.7612	-0.273	11.343
14400	16.97203472	0.77490012	3.9424	0.18	0.7354	-0.3075	10.9576
16200	17.21914176	0.08610001	3.9998	0.02	0.7315	-0.3127	10.9002
18000	18.1012364	0.43050007	4.2047	0.1	0.7178	-0.332	10.6953
19800	18.39526794	0.47355008	4.273	0.11	0.7132	-0.338	10.627
21600	19.44482711	0.21525003	4.5168	0.05	0.6938	-0.3657	10.3832
23400	19.3897231	0.94710015	4.504	0.22	0.6977	-0.3601	10.396
25200							

Table 1.38: Corsican pine samples modified with acetic anhydride at 80^0C.

Time(sec)	WPG (%)	Std. Dev	mmoles/gm	Std. Dev	[OH]t/[OH]0	ln([OH]t/[OH]o)	14.9-[OH]t
0	0	0	0	0	1	0	14.9
900	4.404446205	0.43050007	1.0231	0.1	0.9313	-0.07121	13.8769
1800	6.474850186	0.55965009	1.50403	0.13	0.899	-0.1064	13.39597
2700	7.619162419	0.08610001	1.76984	0.02	0.8812	-0.1265	13.13016
3600	7.971569775	0.6457501	1.8517	0.15	0.8757	-0.1327	13.0483
4500	8.712589544	0.90405014	2.02383	0.21	0.8641	-0.146	12.87617
5400	9.431998209	0.81795013	2.19094	0.19	0.8529	-0.159	12.70906
6300	10.87916724	0.04305001	2.5271	0.01	0.8303	-0.1859	12.3729
7200	11.95800041	0.68880011	2.7777	0.16	0.8135	-0.2066	12.1223
8100	13.42428365	0.6457501	3.1183	0.15	0.7907	-0.2349	11.7817
9000	12.43800799	0.77490012	2.8892	0.18	0.806	-0.2157	12.0108
9900	14.27279928	0.86100014	3.3154	0.2	0.7774	-0.2518	11.5846
10800	14.29044979	0.90405014	3.3195	0.21	0.7772	-0.2525	11.5805
12600	16.09080107	1.03320017	3.7377	0.24	0.7491	-0.2891	11.1623
14400	17.94022937	0.34440006	4.1673	0.08	0.7203	-0.3283	10.7327
16200	18.31519493	0.38745006	4.2544	0.09	0.7144	-0.3363	10.6456
18000	19.12840956	0.30135005	4.4433	0.07	0.7017	-0.3545	10.4567
19800	19.24593608	0.47355008	4.4706	0.11	0.6999	-0.3576	10.4294
21600	18.79348051	0.68880011	4.3655	0.16	0.707	-0.3468	10.5345
23400	19.3440901	0.6457501	4.4934	0.15	0.6987	-0.3591	10.4066
25200							

Table 1.39: Corsican pine samples modified with acetic anhydride at 90^0C.

Time(sec)	WPG (%)	Std. Dev	mmoles/gm	Std. Dev	[OH]t/[OH]0	ln([OH]t/[OH]o)	14.9-[OH]t
0	0	0	0	0	1	0	14.9
900	5.730816917	0.21525003	1.3312	0.05	0.9106	0.09371	13.5688
1800	7.571204711	0.38745006	1.7587	0.09	0.8819	-0.1256	13.1413
2700	8.845786265	0.6457501	2.05477	0.15	0.862	-0.1484	12.84523
3600	9.579057033	0.77490012	2.2251	0.18	0.8506	-0.1617	12.6749
4500	11.21263259	0.94710015	2.60456	0.22	0.8251	-0.1921	12.29544
5400	12.09300523	0.99015016	2.80906	0.23	0.8114	-0.2089	12.09094
6300	12.85301006	1.33455021	2.9856	0.31	0.7996	-0.2236	11.9144
7200	13.83670271	0.94710015	3.2141	0.22	0.7842	-0.2429	11.6859
8100	14.68048285	0.47355008	3.4101	0.11	0.7711	-0.2599	11.4899
9000	15.41104147	0.38745006	3.5798	0.09	0.7597	-0.2748	11.3202
9900	16.2651536	0.34440006	3.7782	0.08	0.7464	-0.2925	11.1218
10800	16.34135211	0.47355008	3.7959	0.11	0.7452	-0.2941	11.1041
12600	17.79644235	1.03320017	4.1339	0.24	0.7225	-0.3249	10.7661
14400	18.38794944	0.6457501	4.2713	0.15	0.7133	-0.3378	10.6287
16200	18.96568053	0.55965009	4.4055	0.13	0.7043	-0.3606	10.4945
18000	19.9795082	0.86100014	4.641	0.2	0.6885	-0.3732	10.259
19800	20.46037677	0.90405014	4.7527	0.21	0.681	-0.3841	10.1473
21600	21.40360242	0.34440006	4.9718	0.08	0.6663	-0.406	9.9282
23400	21.8702645	0.38745006	5.0802	0.09	0.659	-0.417	9.8198
25200	22.42733159	0.47355008	5.2096	0.11	0.6503	-0.4302	9.6904

Table 1.40: Corsican pine samples modified with acetic anhydride at 100^0C.

Time(sec)	WPG (%)	Std. Dev	mmoles/gm	Std. Dev	[OH]t/[OH]0	ln([OH]t/[OH]o)	14.9-[OH]t
0	0	0	0	0	1	0	14.9
900	6.391634523	0.47355008	1.4847	0.11	0.9003	-0.105	13.4153
1800	8.06365374	0.6457501	1.87309	0.15	0.8742	-0.1344	13.02691
2700	7.709825734	0.38745006	1.7909	0.09	-0.8798	-0.128	13.1091
3600	8.959007783	0.34440006	2.08107	0.08	0.8603	-0.1505	12.81893
4500	9.801754718	0.68880011	2.27683	0.16	0.8471	-0.1658	12.62317
5400	10.42972517	0.81795013	2.4227	0.19	0.8373	-0.1775	12.4773
6300	10.56662419	0.90405014	2.4545	0.21	0.8352	-0.18	12.4455
7200	11.69625637	0.94710015	2.7169	0.22	0.8176	-0.2015	12.1831
8100	10.6544462	0.90405014	2.4749	0.21	0.8338	-0.1817	12.4251
9000	12.57835101	0.6457501	2.9218	0.15	0.8039	-0.2183	11.9782
9900	15.08859691	0.17220003	3.5049	0.04	0.7647	-0.2648	11.3951
10800	14.31757129	0.38745006	3.3258	0.09	0.7767	-0.2527	11.5742
12600	15.96681705	0.43050007	3.7089	0.1	0.751	-0.2865	11.1911
14400	16.78605869	0.51660008	3.8992	0.12	0.7383	-0.3037	11.0008
16200	17.53383731	0.6457501	4.0729	0.15	0.7266	-0.3196	10.8271
18000	18.05172889	0.68880011	4.1932	0.16	0.7185	-0.3306	10.7068
19800	19.32514809	0.34440006	4.489	0.08	0.6987	-0.3585	10.411
21600	18.65184598	0.04305001	4.3326	0.01	0.7092	-0.3436	10.5674
23400	19.47582312	0.51660008	4.524	0.12	0.6963	-0.3619	10.376
25200							

Table 1.41: Corsican pine samples modified with acetic anhydride at 110^0C.

Time(sec)	WPG (%)	Std. Dev	mmoles/gm	Std. Dev	[OH]t/[OH]0	ln([OH]t/[OH]o)	14.9-[OH]t
0	0	0	0	0	1	0	14.9
900	6.679208569	0.38745006	1.5515	0.09	0.8958	-0.1099	13.3485
1800	8.760676402	0.43050007	2.035	0.1	0.8634	-0.1469	12.865
2700	11.02682876	0.6457501	2.5614	0.15	0.828	-0.189	12.3386
3600	11.59810236	0.55965009	2.6941	0.13	0.8191	-0.1997	12.2059
4500	12.43452094	0.90405014	2.88839	0.21	0.8061	-0.2155	12.01161
5400	13.99469624	0.21525003	3.2508	0.05	0.7814	-0.2468	11.6492
6300	14.89185838	0.25830004	3.4592	0.06	0.7678	-0.2643	11.4408
7200	16.00986706	0.38745006	3.7189	0.09	0.7504	-0.2872	11.1811
8100	16.97246522	0.34440006	3.9425	0.08	0.7354	-0.3074	10.9575
9000	17.03962323	0.90405014	3.9581	0.21	0.7343	-0.3088	10.9419
9900	17.52871435	0.94710015	4.07171	0.22	0.7267	-0.3194	10.82829
10800	19.3677676	0.6457501	4.4989	0.15	0.698	-0.3595	10.4011
12600	19.62176264	0.77490012	4.5579	0.18	0.694	-0.3652	10.3421
14400	19.54556413	0.68880011	4.5402	0.16	0.6952	-0.3635	10.3598
16200	20.31013225	1.33455021	4.7178	0.31	0.6833	-0.3808	10.1822
18000	21.29511641	0.94710015	4.9466	0.22	0.668	-0.4035	9.9534
19800	22.21940006	1.11930018	5.1613	0.26	0.6536	-0.426	9.7387
21600	22.54012261	0.90405014	5.2358	0.21	0.6485	-0.433	9.6642
23400	22.16214355	0.47355008	5.148	0.11	0.6544	-0.4239	9.752
25200	23.52467626	0.68880011	5.4645	0.16	0.6325	-0.457	9.4355

Table 1.42: Corsican pine samples modified with acetic anhydride at 120^{0}C.

Time(sec)	WPG (%)	Std. Dev	mmoles/gm	Std. Dev	[OH]t/[OH]0	ln([OH]t/[OH]o)	14.9-[OH]t
0	0	0	0	0	1	0	14.9
900	8.56006337	0.43050007	1.9884	0.1	0.8665	-0.1433	12.9116
1800	10.35051316	0.47355008	2.4043	0.11	0.8386	-0.176	12.4957
2700	9.333241493	0.21525003	2.168	0.05	0.8544	-0.1576	12.732
3600	10.86194724	0.12915002	2.5231	0.03	0.8306	-0.1857	12.3769
4500	10.93297975	0.51660008	2.5396	0.12	0.8295	-0.1871	12.3604
5400	12.67478303	0.6457501	2.9442	0.15	0.8024	-0.2204	11.9558
6300	13.7221897	0.68880011	3.1875	0.16	0.786	-0.2411	11.7125
7200	14.08940625	0.94710015	3.2728	0.22	0.7803	-0.2482	11.6272
8100	14.90305138	0.21525003	3.4618	0.05	0.7676	-0.2647	11.4382
9000	16.21091059	0.38745006	3.7656	0.09	0.7472	-0.2914	11.1344
9900	16.54282615	0.47355008	3.8427	0.11	0.742	-0.2984	11.0573
10800	17.15542774	0.90405014	3.985	0.21	0.7325	-0.3123	10.915
12600	17.43094779	0.90405014	4.049	0.21	0.7282	-0.3172	10.851
14400	19.50768012	0.94710015	4.5314	0.22	0.6958	-0.3627	10.3686
16200	19.71475065	0.6027001	4.5795	0.14	0.6962	-0.3673	10.3205
18000	24.4033269	0.55965009	5.6686	0.13	0.6866	-0.3759	9.2314
19800	21.79880149	0.21525003	5.0636	0.05	0.6601	-0.4153	9.8364
21600	22.21767805	0.25830004	5.1609	0.06	0.6536	-0.4253	9.7391
23400	21.83625499	0.21525003	5.0723	0.05	0.6592	-0.4162	9.8277
25200	22.46693759	1.33455021	5.2188	0.31	0.6561	-0.4309	9.6812

Table 1.43: Corsican pine samples modified with propionic anhydride at 60^0C.

Time(sec)	WPG (%)	Std. Dev	mmoles/gm	Std. Dev	[OH]t/[OH]0	ln([OH]t/[OH]o)	14.9-[OH]t
0	0	0	0	0	1	0	14.9
900	4.833555867	0.28530019	0.8471	0.05	0.9431	-0.05856	14.0529
1800	5.74023988	0.45648031	1.006	0.08	0.9324	-0.06992	13.894
2700	7.038926358	0.57060039	1.2336	0.1	0.9172	-0.08643	13.6664
3600	7.820078286	0.68472046	1.3705	0.12	0.908	-0.09652	13.5295
4500	8.443744508	0.7417805	1.4798	0.13	0.9006	-0.1046	13.4202
5400	9.292797882	0.45648031	1.6286	0.08	0.8906	-0.1157	13.2714
6300	9.824597441	0.51354035	1.7218	0.09	0.8844	-0.1228	13.1782
7200	10.32444338	0.68472046	1.8094	0.12	0.8785	-0.1295	13.0906
8100	10.83113652	1.08414073	1.8982	0.19	0.8725	-0.1362	13.0018
9000	11.32641766	1.02708069	1.985	0.18	0.8667	-0.143	12.915
9900	11.8336814	1.14120077	2.0739	0.2	0.8608	-0.1498	12.8261
10800	12.33695094	1.19826081	2.1621	0.21	0.8548	-0.1568	12.7379
12600	12.75120682	1.36944093	2.2347	0.24	0.85	-0.1625	12.6653
14400	13.55461216	1.31238089	2.3755	0.23	0.8405	-0.1736	12.5245
16200	14.30894587	0.85590058	2.5077	0.15	0.8316	-0.1842	12.3923
18000	14.80993301	0.68472046	2.5955	0.12	0.8257	-0.1914	12.3045
19800	15.2418775	0.79884054	2.6712	0.14	0.8207	-0.1975	12.2288
21600	15.8227487	0.57060039	2.773	0.1	0.8138	-0.2059	12.127
23400	16.43956771	0.51354035	2.8811	0.09	0.8066	-0.2148	12.0189
25200							

Table 1.44: Corsican pine samples modified with propionic anhydride at 70^0C.

Time(sec)	WPG (%)	Std. Dev	mmoles/gm	Std. Dev	[OH]t/[OH]0	ln([OH]t/[OH]o)	14.9-[OH]t
0	0	0	0	0	1	0	14.9
900	6.283451448	0.57060039	1.1012	0.1	0.926	-0.07679	13.7988
1800	6.650918096	0.62766042	1.1656	0.11	0.9217	-0.08147	13.7344
2700	7.789836466	0.28530019	1.3652	0.05	0.9083	-0.0961	13.5348
3600	8.600089014	0.45648031	1.5072	0.08	0.8988	-0.1066	13.3928
4500	10.23657092	0.7417805	1.794	0.13	0.8795	-0.1283	13.106
5400	10.97264542	0.34236023	1.923	0.06	0.8709	-0.138	12.977
6300	11.35095347	1.08414073	1.9893	0.19	0.8664	-0.1433	12.9107
7200	12.21826606	1.14120077	2.1413	0.2	0.8562	-0.1551	12.7587
8100	12.75748342	1.19826081	2.2358	0.21	0.8499	-0.1625	12.6642
9000	12.93836375	0.45648031	2.2675	0.08	0.8478	-0.1651	12.6325
9900	13.51010533	0.51354035	2.3677	0.09	0.841	-0.173	12.5323
10800	14.24389743	0.68472046	2.4963	0.12	0.8324	-0.1833	12.4037
12600	15.30007874	0.28530019	2.6814	0.05	0.82	-0.1984	12.2186
14400	15.99221701	0.85590058	2.8027	0.15	0.8118	-0.2083	12.0973
16200	16.83613498	1.08414073	2.9506	0.19	0.8019	-0.2207	11.9494
18000	17.36793454	0.68472046	3.0438	0.12	0.7957	-0.2285	11.8562
19800	17.88718089	0.57060039	3.1348	0.1	0.7896	-0.2362	11.7652
21600	18.37219122	0.34236023	3.2198	0.06	0.739	-0.2434	11.6802
23400	20.02464994	0.45648031	3.5094	0.08	0.7644	-0.2687	11.3906
25200							

Table 1.45: Corsican pine samples modified with propionic anhydride at 80^0C.

Time(sec)	WPG (%)	Std. Dev	mmoles/gm	Std. Dev	[OH]t/[OH]0	ln([OH]t/[OH]o)	14.9-[OH]t
0	0	0	0	0	1	0	14.9
900	5.520558732	0.28530019	0.9675	0.05	0.9356	-0.06716	13.9325
1800	6.480879181	0.22824015	1.1358	0.04	0.9237	-0.0793	13.7642
2700	7.817225284	0.68472046	1.37	0.12	0.908	-0.09649	13.53
3600	8.824905566	0.79884054	1.5466	0.14	0.8962	-0.1096	13.3534
4500	10.01175437	1.02708069	1.7546	0.18	0.8822	-0.1253	13.1454
5400	10.81630091	0.79884054	1.8956	0.14	0.8727	-0.136	13.0044
6300	11.56492862	1.25532085	2.0268	0.22	0.8639	-0.1462	12.8732
7200	12.11898159	1.19826081	2.1239	0.21	0.8574	-0.1538	12.7761
8100	12.69757038	0.51354035	2.2253	0.09	0.8506	-0.1617	12.6747
9000	13.39370285	1.14120077	2.3473	0.2	0.8424	-0.1714	12.5527
9900	14.00025106	0.45648031	2.4536	0.08	0.8353	-0.1799	12.4464
10800	14.56058064	0.57060039	2.5518	0.1	0.8287	-0.1878	12.3482
12600	15.25671311	0.51354035	2.6738	0.09	0.8205	-0.1978	12.2262
14400	16.67522567	0.62766042	2.9224	0.11	0.8038	-0.2183	11.9776
16200	17.70858297	0.91296062	3.1035	0.16	0.7917	-0.2335	11.7965
18000	18.52967693	0.22824015	3.2474	0.04	0.782	-0.2458	11.6526
19800	19.13736634	0.7417805	3.3539	0.13	0.7749	-0.255	11.5461
21600	20.07486277	0.28530019	3.5182	0.05	0.7638	-0.2693	11.3818
23400	21.73702169	1.25532085	3.8095	0.22	0.7443	-0.2952	11.0905
25200							

Table 1.46: Corsican pine samples modified with propionic anhydride at 90^0C.

Time(sec)	WPG (%)	Std. Dev	mmoles/gm	Std. Dev	[OH]t/[OH]0	ln([OH]t/[OH]o)	14.9-[OH]t
0	0	0	0	0	1	0	14.9
900	6.96817191	0.51354035	1.2212	0.09	0.918	-0.08552	13.6788
1800	8.408367284	0.62766042	1.4736	0.11	0.901	-0.1041	13.4264
2700	9.889189405	0.68472046	1.73312	0.12	0.8836	-0.1236	13.16688
3600	10.76323508	0.45648031	1.8863	0.08	0.8733	-0.1353	13.0137
4500	11.51642759	0.85590058	2.0183	0.15	0.8645	-0.1455	12.8817
5400	12.37803417	0.62766042	2.1693	0.11	0.8544	-0.1573	12.7307
6300	13.59569539	0.97002066	2.3827	0.17	0.84	-0.1742	12.5173
7200	14.0567405	1.25532085	2.4635	0.22	0.8346	-0.1807	12.4365
8100	14.47099638	1.19826081	2.5361	0.21	0.8297	-0.1865	12.3639
9000	14.93147089	1.14120077	2.6168	0.2	0.8243	-0.1931	12.2832
9900	15.66355119	0.85590058	2.7451	0.15	0.8154	-0.2039	12.1549
10800	16.53656978	0.34236023	2.8981	0.06	0.8054	-0.2163	12.0019
12600	17.22585504	0.45648031	3.0189	0.08	0.7973	-0.2264	11.8811
14400	18.86633115	0.85590058	3.3064	0.15	0.778	-0.2509	11.5936
16200	19.61781186	0.22824015	3.4381	0.04	0.7692	-0.2623	11.4619
18000	20.51536627	0.45648031	3.5954	0.08	0.7586	-0.2761	11.3046
19800	21.20636334	0.22824015	3.7165	0.04	0.7505	-0.2869	11.1835
21600	22.09821174	0.51354035	3.8728	0.09	0.74	-0.301	11.0272
23400	23.2217239	0.57060039	4.0697	0.1	0.7208	-0.319	10.8303
25200							

Table 1.47: Corsican pine samples modified with propionic anhydride at 100^0C.

Time(sec)	WPG (%)	Std. Dev	mmoles/gm	Std. Dev	[OH]t/[OH]0	ln([OH]t/[OH]o)	14.9-[OH]t
0	0	0	0	0	1	0	14.9
900	5.359078823	0.57060039	0.9392	0.1	0.9369	-0.06513	13.9608
1800	7.076015383	0.68472046	1.2401	0.12	0.9167	-0.08696	13.6599
2700	8.862565191	0.45648031	1.5532	0.08	0.8957	-0.1101	13.3468
3600	9.609481096	0.68472046	1.6841	0.12	0.8869	-0.1199	13.2159
4500	11.01087564	0.7417805	1.9297	0.13	0.8704	-0.1387	12.9703
5400	12.1309642	1.7688612	2.126	0.31	0.8573	-0.1539	12.774
6300	13.17801591	1.42650096	2.3095	0.25	0.8449	-0.1684	12.5905
7200	13.81081174	1.65474112	2.4204	0.29	0.8375	-0.1772	12.4796
8100	14.67298892	0.85590058	2.5715	0.15	0.8274	-0.1894	12.3285
9000	16.53200498	0.7417805	2.8973	0.13	0.8055	-0.2162	12.0027
9900	16.75510973	1.36944093	2.9364	0.24	0.8029	-0.2195	11.9636
10800	17.48034282	0.62766042	3.0635	0.11	0.7943	-0.2301	11.8365
12600	18.95648601	0.68472046	3.3222	0.12	0.777	-0.2522	11.5778
14400	19.44606115	1.88298127	3.408	0.33	0.7712	-0.2597	11.492
16200	20.54503749	0.51354035	3.6006	0.09	0.7543	-0.2819	11.2994
18000	21.94928504	0.45648031	3.8467	0.08	0.7418	-0.2986	11.0533
19800	22.81317402	0.85590058	3.9981	0.15	0.7316	-0.3124	10.9019
21600	23.39861002	0.79884054	4.1007	0.14	0.7247	-0.3218	10.7993
23400	24.61284764	0.7417805	4.3135	0.13	0.7104	-0.3417	10.5865
25200	25.16176521	0.62766042	4.4097	0.11	0.704	-0.3509	10.4903

Table 1.48: Corsican pine samples modified with propionic anhydride at 110^0C.

Time(sec)	WPG (%)	Std. Dev	mmoles/gm	Std. Dev	[OH]t/[OH]0	ln([OH]t/[OH]o)	14.9-[OH]t
0	0	0	0	0	1	0	14.9
900	5.830394741	0.45648031	1.0218	0.08	0.9314	-0.07106	13.8782
1800	6.765038173	0.51354035	1.1856	0.09	0.9204	-0.08291	13.7144
2700	9.515902633	0.62766042	1.6677	0.11	0.888	-0.1187	13.2323
3600	11.00859324	0.85590058	1.9293	0.15	0.8705	-0.1388	12.9707
4500	13.25219396	1.19826081	2.3225	0.21	0.8501	-0.1624	12.5775
5400	14.36486471	1.02708069	2.5175	0.18	0.831	-0.1851	12.3825
6300	14.7996622	1.08414073	2.5937	0.19	0.8259	-0.1912	12.3063
7200	16.1177491	0.34236023	2.8247	0.06	0.8104	-0.2102	12.0753
8100	17.6064455	0.28530019	3.0856	0.05	0.7929	-0.232	11.8144
9000	17.81243224	1.19826081	3.1217	0.21	0.7904	-0.2351	11.7783
9900	18.84921314	1.25532085	3.3034	0.22	0.7782	-0.2506	11.5966
10800	19.11225992	1.42650096	3.3495	0.25	0.7751	-0.2546	11.5505
12600	20.75387723	0.45648031	3.6372	0.08	0.7558	-0.2799	11.2628
14400	21.7490043	1.02708069	3.8116	0.18	0.7441	-0.2956	11.0884
16200	21.57725359	0.68472046	3.7815	0.12	0.7462	-0.2928	11.1185
18000	24.14495532	0.91296062	4.2315	0.16	0.716	-0.3341	10.6685
19800	24.78174535	1.25532085	4.3431	0.22	0.7085	-0.3466	10.5569
21600	25.73179499	0.97002066	4.5096	0.17	0.6973	-0.3605	10.3904
23400	26.72007486	0.7417805	4.6828	0.13	0.6857	-0.3773	10.2172
25200	27.32491127	1.25532085	4.7888	0.22	0.6786	-0.3877	10.1112

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Table 1.50: Corsican pine samples modified with butyric anhydride at 60^0C.

Time(sec)	WPG (%)	Std. Dev	mmoles/gm	Std. Dev	[OH]t/[OH]0	ln([OH]t/[OH]o)	14.9-[OH]t
0	0	0	0	0	1	0	14.9
900	3.772941886	0.63900032	0.5314	0.09	0.964	-0.03633	14.3686
1800	4.375022188	0.78100039	0.6162	0.11	0.958	-0.04224	14.2838
2700	4.909652455	0.85200043	0.6915	0.12	0.953	-0.04754	14.2085
3600	5.437182719	0.92300046	0.7658	0.13	0.948	-0.05277	14.1342
4500	6.185523093	0.35500018	0.8712	0.05	0.941	-0.06026	14.0288
5400	7.188753594	0.56800028	1.0125	0.08	0.932	-0.07037	13.8875
6300	7.578472789	0.78100039	1.06739	0.11	0.928	-0.07433	13.83261
7200	7.95981398	0.85200043	1.1211	0.12	0.924	-0.07823	13.7789
8100	8.364514182	1.77500089	1.1781	0.25	0.92	-0.08237	13.7219
9000	9.410344705	1.49100075	1.3254	0.21	0.911	-0.09317	13.5746
9900	9.986154993	0.78100039	1.4065	0.11	0.905	-0.09915	13.4935
10800	10.34754517	1.34900067	1.4574	0.19	0.902	-0.1029	13.4426
12600	11.10014555	1.27800064	1.5634	0.18	0.895	-0.1108	13.3366
14400	11.65820583	1.27800064	1.642	0.18	0.889	-0.1167	13.258
16200	12.14739607	0.56800028	1.7109	0.08	0.885	-0.1219	13.1891
18000	13.28623664	1.49100075	1.8713	0.21	0.874	-0.1342	13.0287
19800	13.89115695	0.78100039	1.9565	0.11	0.868	-0.1407	12.9435
21600	14.33277717	1.06500053	2.0187	0.15	0.864	-0.1455	12.8813
23400	14.92846746	1.06500053	2.1026	0.15	0.858	-0.1521	12.7974
25200							

Table 1.51: Corsican pine samples modified with butyric anhydride at 70^0C.

Time(sec)	WPG (%)	Std. Dev	mmoles/gm	Std. Dev	[OH]t/[OH]0	ln([OH]t/[OH]o)	14.9-[OH]t
0	0	0	0	0	1	0	14.9
900	6.72015336	0.71000036	0.9465	0.1	0.936	-0.06566	13.9535
1800	7.773509887	0.35500018	1.09486	0.05	0.926	-0.07636	13.80514
2700	8.458376229	0.63900032	1.19132	0.09	0.92	-0.08334	13.70868
3600	9.112854556	0.78100039	1.2835	0.11	0.913	-0.09009	13.6165
4500	9.802264901	0.85200043	1.3806	0.12	0.907	-0.09724	13.5194
5400	11.01565551	1.06500053	1.5515	0.15	0.895	-0.1099	13.3485
6300	12.17508609	1.49100075	1.7148	0.21	0.884	-0.1222	13.1852
7200	12.37743619	1.49100075	1.7433	0.21	0.882	-0.1245	13.1567
8100	12.66995633	1.34900067	1.7845	0.19	0.88	-0.1275	13.1155
9000	12.77858639	0.92300046	1.7998	0.13	0.879	-0.1287	13.1002
9900	14.09563705	1.2070006	1.9853	0.17	0.866	-0.143	12.9147
10800	14.35620718	1.06500053	2.022	0.15	0.864	-0.1459	12.878
12600	15.02999751	1.13600057	2.1169	0.16	0.857	-0.1533	12.7831
14400	15.81241791	1.42000071	2.2271	0.2	0.85	-0.1619	12.6729
16200	16.16528808	0.56800028	2.2768	0.08	0.847	-0.1658	12.6232
18000	16.69352835	0.63900032	2.3512	0.09	0.842	-0.1717	12.5488
19800	17.86715893	0.85200043	2.5165	0.12	0.831	-0.185	12.3835
21600	18.73051937	0.92300046	2.6381	0.13	0.822	-0.1948	12.2619
23400	19.97443999	1.27800064	2.8133	0.18	0.811	-0.2092	12.0867
25200							

Table 1.52: Corsican pine samples modified with butyric anhydride at 80^0C.

Time(sec)	WPG (%)	Std. Dev	mmoles/gm	Std. Dev	[OH]t/[OH]0	ln([OH]t/[OH]o)	14.9-[OH]t
0	0	0	0	0	1	0	14.9
900	7.861123931	0.56800028	1.1072	0.08	0.925	-0.07724	13.7928
1800	9.143384572	0.85200043	1.2878	0.12	0.913	-0.09042	13.6122
2700	9.763924882	0.9940005	1.3752	0.14	0.907	-0.09684	13.5248
3600	10.76147538	1.42000071	1.5157	0.2	0.898	-0.1072	13.3843
4500	11.65252583	1.34900067	1.6412	0.19	0.889	-0.1169	13.2588
5400	12.96034648	1.27800064	1.8254	0.18	0.877	-0.1307	13.0746
6300	13.993397	0.56800028	1.9709	0.08	0.867	-0.1418	12.9291
7200	14.31715716	0.63900032	2.0165	0.09	0.865	-0.1454	12.8835
8100	15.10525755	0.71000036	2.1275	0.1	0.857	-0.154	12.7725
9000	15.98068799	0.78100039	2.2508	0.11	0.848	-0.1637	12.6492
9900	16.66086833	0.85200043	2.3466	0.12	0.842	-0.1713	12.5534
10800	17.43689872	1.77500089	2.4559	0.25	0.835	-0.18	12.4441
12600	17.85579893	1.49100075	2.5149	0.21	0.831	-0.1848	12.3851
14400	18.58496929	1.06500053	2.6176	0.15	0.824	-0.1932	12.2824
16200	19.94390997	1.34900067	2.809	0.19	0.811	-0.2089	12.091
18000	20.46221023	0.92300046	2.882	0.13	0.806	-0.2149	12.018
19800	21.26806063	0.85200043	2.9955	0.12	0.798	-0.2244	11.9045
21600	21.92552096	1.06500053	3.0881	0.15	0.792	-0.2322	11.8119
23400	22.92804146	0.63900032	3.2293	0.09	0.783	-0.2442	11.6707
25200							

Table 1.53: Corsican pine samples modified with butyric anhydride at 90^0C.

Time(sec)	WPG (%)	Std. Dev	mmoles/gm	Std. Dev	[OH]t/[OH]0	ln([OH]t/[OH]o)	14.9-[OH]t
0	0	0	0	0	1	0	14.9
900	6.617913309	0.71000036	0.9321	0.1	0.937	-0.06403	13.9679
1800	7.947033974	0.78100039	1.1193	0.11	0.924	-0.0781	13.7807
2700	9.062444531	0.71000036	1.2764	0.1	0.914	-0.08957	13.6236
3600	10.81117541	1.06500053	1.5227	0.15	0.897	-0.1078	13.3773
4500	11.77109589	1.34900067	1.6579	0.19	0.888	-0.1179	13.2421
5400	12.88366644	1.27800064	1.8146	0.18	0.878	-0.1299	13.0854
6300	12.94898647	1.42000071	1.8238	0.2	0.877	-0.1306	13.0762
7200	14.65724733	1.77500089	2.0644	0.25	0.861	-0.1491	12.8356
8100	15.15850758	2.05900103	2.135	0.29	0.856	-0.1546	12.765
9000	16.05097803	0.56800028	2.2607	0.08	0.848	-0.1646	12.6393
9900	16.38680819	0.63900032	2.308	0.09	0.845	-0.1683	12.592
10800	17.15502858	2.13000107	2.4162	0.3	0.837	-0.1769	12.4838
12600	18.29954915	0.56800028	2.5774	0.08	0.827	-0.1899	12.3226
14400	18.95771948	0.78100039	2.6701	0.11	0.82	-0.1975	12.2299
16200	19.28644964	1.06500053	2.7164	0.15	0.814	-0.2049	12.1836
18000	20.13845007	1.49100075	2.8364	0.21	0.807	-0.2134	12.0636
19800	20.91590046	1.56200078	2.9459	0.22	0.802	-0.2202	11.9541
21600	22.21875111	1.70400085	3.1294	0.24	0.789	-0.2358	11.7706
23400	23.93837197	1.06500053	3.3716	0.15	0.773	-0.2565	11.5284
25200							

Table 1.54: Corsican pine samples modified with butyric anhydride at 100^0C.

Time(sec)	WPG (%)	Std. Dev	mmoles/gm	Std. Dev	[OH]t/[OH]0	ln([OH]t/[OH]o)	14.9-[OH]t
0	0	0	0	0	1	0	14.9
900	6.826653413	0.63900032	0.9615	0.09	0.935	-0.06677	13.9385
1800	9.815754908	0.71000036	1.3825	0.1	0.907	-0.09743	13.5175
2700	11.43242572	0.85200043	1.6102	0.12	0.891	-0.1143	13.2898
3600	12.1928361	1.06500053	1.7173	0.15	0.884	-0.1224	13.1827
4500	12.77716639	0.35500018	1.7996	0.05	0.879	-0.1287	13.1004
5400	14.42720721	1.49100075	2.032	0.21	0.863	-0.1466	12.868
6300	15.45173773	1.34900067	2.1763	0.19	0.853	-0.1579	12.7237
7200	16.55436828	1.56200078	2.3316	0.22	0.843	-0.1702	12.5684
8100	16.94628847	0.42600021	2.3868	0.06	0.839	-0.1746	12.5132
9000	18.07518904	1.06500053	2.5458	0.15	0.829	-0.1784	12.3542
9900	18.22499911	1.2070006	2.5669	0.17	0.827	-0.1891	12.3331
10800	18.75252938	1.56200078	2.6412	0.22	0.822	-0.1951	12.2588
12600	20.35997018	1.63300082	2.8676	0.23	0.807	-0.2137	12.0324
14400	21.86801093	1.77500089	3.08	0.25	0.793	-0.2315	11.82
16200	23.05513153	1.34900067	3.2472	0.19	0.782	-0.2458	11.6528
18000	23.46693173	0.56800028	3.3052	0.08	0.778	-0.2508	11.5948
19800	24.45880223	0.63900032	3.4449	0.09	0.768	-0.2629	11.4551
21600	25.61823281	0.71000036	3.6082	0.1	0.757	-0.2773	11.2918
23400	26.27640314	1.63300082	3.7009	0.23	0.751	-0.2855	11.1991
25200	27.74042387	1.06500053	3.9071	0.15	0.737	-0.3041	10.9929

Table 1.55: Corsican pine samples modified with butyric anhydride at 110^0C.

Time(sec)	WPG (%)	Std. Dev	mmoles/gm	Std. Dev	[OH]t/[OH]0	ln([OH]t/[OH]o)	14.9-[OH]t
0	0	0	0	0	1	0	14.9
900	8.750754375	0.14200007	1.2325	0.02	0.917	-0.08636	13.6675
1800	11.01991551	0.56800028	1.5521	0.08	0.895	-0.11	13.3479
2700	12.21839611	0.71000036	1.7209	0.1	0.884	-0.1227	13.1791
3600	14.06013703	0.85200043	1.9803	0.12	0.867	-0.1426	12.9197
4500	14.93911747	0.92300046	2.1041	0.13	0.858	-0.1522	12.7959
5400	15.89335795	1.70400085	2.2385	0.24	0.849	-0.1628	12.6615
6300	17.41843871	1.49100075	2.4533	0.21	0.835	-0.1799	12.4467
7200	18.36770918	1.06500053	2.587	0.15	0.826	-0.1907	12.313
8100	19.12456956	1.2070006	2.6936	0.17	0.819	-0.1994	12.2064
9000	20.00213	1.13600057	2.8172	0.16	0.81	-0.2095	12.0828
9900	21.09979055	1.56200078	2.9718	0.22	0.8	-0.2224	11.9282
10800	21.87432994	1.27800064	3.08089	0.18	0.793	-0.2316	11.81911
12600	22.11509106	1.56200078	3.1148	0.22	0.79	-0.2345	11.7852
14400	23.11761156	0.42600021	3.256	0.06	0.781	-0.2466	11.644
16200	24.18403209	0.35500018	3.4062	0.05	0.771	-0.2595	11.4938
18000	25.98104299	0.28400014	3.6593	0.04	0.754	-0.2818	11.2407
19800	27.28460364	1.63300082	3.8429	0.23	0.742	-0.2983	11.0571
21600	28.2083141	0.85200043	3.973	0.12	0.733	-0.3101	10.927
23400	28.15790408	1.56200078	3.9659	0.22	0.733	-0.3094	10.9341
25200	29.42099471	0.9940005	4.1438	0.14	0.721	-0.3259	10.7562

Table 1.56: Corsican pine samples modified with butyric anhydride at 120^0C.

Time(sec)	WPG (%)	Std. Dev	mmoles/gm	Std. Dev	[OH]t/[OH]0	ln([OH]t/[OH]o)	14.9-[OH]t
0	0	0	0	0	1	0	14.9
900	6.593063297	0.78100039	0.9286	0.11	0.937	-0.0644	13.9714
1800	7.170293585	0.78100039	1.0099	0.11	0.932	-0.07024	13.8901
2700	10.62160531	1.06500053	1.496	0.15	0.899	-0.1058	13.404
3600	11.93439597	0.11360006	1.6809	0.016	0.887	-0.1197	13.2191
4500	12.4093862	0.35500018	1.7478	0.05	0.882	-0.1248	13.1522
5400	13.36007668	0.63900032	1.8817	0.09	0.873	-0.135	13.0183
6300	15.47374774	0.56800028	2.1794	0.08	0.853	-0.1586	12.7206
7200	15.74709787	1.06500053	2.2179	0.15	0.851	-0.1612	12.6821
8100	17.62078881	1.49100075	2.4818	0.21	0.833	-0.1823	12.4182
9000	18.64105932	1.56200078	2.6255	0.22	0.823	-0.1938	12.2745
9900	18.95984948	0.21300011	2.6704	0.03	0.82	-0.1977	12.2296
10800	19.14302957	0.56800028	2.6962	0.08	0.819	-0.2004	12.2038
12600	22.73279137	1.06500053	3.2018	0.15	0.785	-0.2421	11.6982
14400	23.50172175	1.2070006	3.3101	0.17	0.777	-0.2512	11.5899
16200	23.66502183	0.08520004	3.3331	0.012	0.776	-0.2534	11.5669
18000	26.37722319	0.85200043	3.7151	0.12	0.75	-0.2872	11.1849
19800	26.65554333	0.35500018	3.7543	0.05	0.748	-0.2963	11.1457
21600	23.87589194	0.21300011	3.3628	0.03	0.774	-0.2594	11.5372
23400	30.55841528	1.06500053	4.304	0.15	0.711	-0.3413	10.596
25200	30.4015052	1.06500053	4.2819	0.15	0.712	-0.3388	10.6181

Table 1.57: Corsican pine samples modified with valeric anhydride at 60^0C.

Time(sec)	WPG (%)	Std. Dev	mmoles/gm	Std. Dev	[OH]t/[OH]0	ln([OH]t/[OH]o)	14.9-[OH]t
0	0	0	0	0	1	0	14.9
900	3.565751783	1.02000051	0.4195	0.12	0.971	-0.02856	14.4805
1800	4.561952281	0.68000034	0.5367	0.08	0.963	-0.03669	14.3633
2700	4.410652205	0.5950003	0.5189	0.07	0.965	-0.03547	14.3811
3600	5.521602761	0.51000026	0.6496	0.06	0.956	-0.04458	14.2504
4500	5.627002814	1.02000051	0.662	0.12	0.955	-0.04545	14.238
5400	9.14005457	0.93500047	1.0753	0.11	0.927	-0.07491	13.8247
6300	10.43035522	1.78500089	1.2271	0.21	0.917	-0.08595	13.6729
7200	11.35260568	1.61500081	1.3356	0.19	0.91	-0.09392	13.5644
8100	12.27060614	1.44500072	1.4436	0.17	0.903	-0.1019	13.4564
9000	13.25490663	0.68000034	1.5594	0.08	0.895	-0.1105	13.3406
9900	13.91620696	0.76500038	1.6372	0.09	0.89	-0.1163	13.2628
10800	14.73220737	0.93500047	1.7332	0.11	0.883	-0.1236	13.1668
12600	15.95025798	1.02000051	1.8765	0.12	0.874	-0.1346	13.0235
14400	17.35700868	1.87000094	2.042	0.22	0.862	-0.1474	12.858
16200	18.63625932	2.04000102	2.1925	0.24	0.852	-0.1592	12.7075
18000	19.18450959	0.68000034	2.257	0.08	0.845	-0.1674	12.643
19800	20.24191012	1.61500081	2.3814	0.19	0.84	-0.1743	12.5186
21600	21.62061081	0.5950003	2.5436	0.07	0.829	-0.1872	12.3564
23400	22.84206142	1.44500072	2.6873	0.17	0.819	-0.199	12.2127
25200							

Table 1.58: Corsican pine samples modified with valeric anhydride at 70^0C.

Time(sec)	WPG (%)	Std. Dev	mmoles/gm	Std. Dev	[OH]t/[OH]0	ln([OH]t/[OH]o)	14.9-[OH]t
0	0	0	0	0	1	0	14.9
900	6.726053363	0.76500038	0.7913	0.09	0.946	-0.05457	14.1087
1800	8.445604223	0.42500021	0.9936	0.05	0.933	-0.06903	13.9064
2700	9.285404643	0.76500038	1.0924	0.09	0.926	-0.07616	13.8076
3600	9.431604716	0.68000034	1.1096	0.08	0.925	-0.07738	13.7904
4500	10.05550503	0.85000043	1.183	0.1	0.92	-0.08274	13.717
5400	10.90890545	0.93500047	1.2834	0.11	0.913	-0.09008	13.6166
6300	11.4044557	0.93500047	1.3417	0.11	0.909	-0.09437	13.5583
7200	11.91020596	1.27500064	1.4012	0.15	0.905	-0.09877	13.4988
8100	12.25615613	0.08500004	1.4419	0.01	0.903	-0.1017	13.4581
9000	12.95230648	1.53000077	1.5238	0.18	0.897	-0.1079	13.3762
9900	13.49970675	1.70000085	1.5882	0.2	0.893	-0.1127	13.3118
10800	14.24600712	1.78500089	1.676	0.21	0.887	-0.1193	13.224
12600	14.83080742	1.87000094	1.7448	0.22	0.882	-0.1245	13.1552
14400	15.41560771	1.10500055	1.8136	0.13	0.878	-0.1297	13.0864
16200	16.3948082	0.08500004	1.9288	0.01	0.87	-0.1386	12.9712
18000	16.78155839	1.27500064	1.9743	0.15	0.867	-0.1421	12.9257
19800	17.32130866	0.76500038	2.0378	0.09	0.863	-0.147	12.8622
21600	18.38805919	0.68000034	2.1633	0.08	0.854	-0.1568	12.7367
23400	19.32390966	0.42500021	2.2734	0.05	0.847	-0.1655	12.6266
25200							

Table 1.59: Corsican pine samples modified with valeric anhydride at 80^0C.

Time(sec)	WPG (%)	Std. Dev	mmoles/gm	Std. Dev	[OH]t/[OH]0	ln([OH]t/[OH]o)	14.9-[OH]t
0	0	0	0	0	1	0	14.9
900	5.1994526	0.85000043	0.6117	0.1	0.958	-0.02161	14.2883
1800	6.533953267	0.93500047	0.7687	0.11	0.948	-0.02886	14.1313
2700	7.667003834	1.27500064	0.902	0.15	0.939	-0.04646	13.998
3600	8.698054349	0.68000034	1.0233	0.08	0.931	-0.06219	13.8767
4500	7.673803837	0.76500038	0.9028	0.09	0.939	-0.06253	13.9972
5400	9.093304547	1.87000094	1.0698	0.22	0.928	-0.07452	13.8302
6300	10.35980518	1.95500098	1.2188	0.23	0.918	-0.08536	13.6812
7200	11.10780555	1.1900006	1.3068	0.14	0.912	-0.0918	13.5932
8100	11.12735556	1.10500055	1.3091	0.13	0.912	-0.09199	13.5909
9000	12.95315648	0.68000034	1.5239	0.08	0.897	-0.1079	13.3761
9900	13.89325695	0.76500038	1.6345	0.09	0.89	-0.1162	13.2655
10800	13.88730694	1.02000051	1.6338	0.12	0.89	-0.1161	13.2662
12600	15.42495771	0.93500047	1.8147	0.11	0.878	-0.1299	13.0853
14400	17.71230886	1.1900006	2.0838	0.14	0.868	-0.1506	12.8162
16200	18.38295919	1.53000077	2.1627	0.18	0.854	-0.1569	12.7373
18000	19.66390983	0.76500038	2.3134	0.09	0.844	-0.1687	12.5866
19800	20.32181016	0.85000043	2.3908	0.1	0.839	-0.1749	12.5092
21600	21.94446097	0.93500047	2.5817	0.11	0.826	-0.1903	12.3183
23400	23.13956157	0.51000026	2.7223	0.06	0.817	-0.2017	12.1777
25200	24.24456212	0.93500047	2.8523	0.11	0.808	-0.2125	12.0477

Table 1.60: Corsican pine samples modified with valeric anhydride at 90^0C.

Time(sec)	WPG (%)	Std. Dev	mmoles/gm	Std. Dev	[OH]t/[OH]0	ln([OH]t/[OH]o)	14.9-[OH]t
0	0	0	0	0	1	0	14.9
900	7.663603832	0.68000034	0.9016	0.08	0.939	-0.06243	13.9984
1800	10.90805545	0.42500021	1.2833	0.05	0.913	-0.09009	13.6167
2700	12.05895603	1.02000051	1.4187	0.12	0.904	-0.1	13.4813
3600	13.63145682	1.10500055	1.6037	0.13	0.892	-0.1138	13.2963
4500	15.58050779	1.27500064	1.833	0.15	0.876	-0.1312	13.067
5400	16.88610844	1.87000094	1.9866	0.22	0.866	-0.143	12.9134
6300	17.7913589	1.61500081	2.0931	0.19	0.859	-0.1513	12.8069
7200	18.93545947	1.53000077	2.2277	0.18	0.85	-0.1919	12.6723
8100	20.72811036	2.55000128	2.4386	0.3	0.836	-0.1787	12.4614
9000	21.6070108	0.68000034	2.542	0.08	0.829	-0.187	12.358
9900	22.4051612	1.27500064	2.6359	0.15	0.823	-0.1947	12.2641
10800	23.32826166	1.53000077	2.7445	0.18	0.815	-0.2035	12.1555
12600	25.24501262	1.1900006	2.97	0.14	0.8	-0.2223	11.93
14400	26.48941324	0.76500038	3.1164	0.09	0.79	-0.2346	11.7836
16200	27.64116382	0.85000043	3.2519	0.1	0.781	-0.2462	11.6481
18000	28.47586424	0.85000043	3.3501	0.1	0.775	-0.2546	11.5499
19800	29.65821483	1.27500064	3.4892	0.15	0.765	-0.2668	11.4108
21600	30.6068153	1.95500098	3.6008	0.23	0.758	-0.2766	11.2992
23400							
25200							

Table 1.61: Corsican pine samples modified with valeric anhydride at 100^0C.

Time(sec)	WPG (%)	Std. Dev	mmoles/gm	Std. Dev	[OH]t/[OH]0	ln([OH]t/[OH]o)	14.9-[OH]t
0	0	0	0	0	1	0	14.9
900	9.092454546	0.85000043	1.0697	0.1	0.942	-0.07305	13.8303
1800	11.57445579	1.02000051	1.3617	0.12	0.908	-0.09585	13.5383
2700	12.81630641	1.02000051	1.5078	0.12	0.898	-0.1067	13.3922
3600	15.15210758	1.70000085	1.7826	0.2	0.088	-0.1274	13.1174
4500	17.08840854	1.78500089	2.0104	0.21	0.865	-0.1449	12.8896
5400	17.8007089	0.68000034	2.0942	0.08	0.859	-0.1515	12.8058
6300	18.6014093	0.76500038	2.1884	0.09	0.853	-0.1588	12.7116
7200	20.06171003	1.02000051	2.3602	0.12	0.841	-0.1724	12.5398
8100	20.72386036	1.27500064	2.4381	0.15	0.836	-0.1786	12.4619
9000	22.6057613	1.1900006	2.6595	0.14	0.821	-0.1966	12.2405
9900	24.94751247	1.1900006	2.935	0.14	0.803	-0.2193	11.965
10800	25.992163	0.08500004	3.0579	0.01	0.794	-0.2297	11.8421
12600	27.18641359	0.68000034	3.1984	0.08	0.785	-0.2416	11.7016
14400	29.76531488	0.68000034	3.5018	0.08	0.764	-0.2679	11.3982
16200	32.17081609	1.02000051	3.7848	0.12	0.745	-0.293	11.1152
18000	33.26816663	0.93500047	3.9139	0.11	0.737	-0.3047	10.9861
19800	35.78161789	1.87000094	4.2096	0.22	0.717	-0.332	10.6904
21600	37.6082688	1.95500098	4.4245	0.23	0.703	-0.3523	10.4755
23400	40.08857004	1.78500089	4.7163	0.21	0.683	-0.3806	10.1837
25200							

Table 1.62: Corsican pine samples modified with valeric anhydride at 110^0C.

Time(sec)	WPG (%)	Std. Dev	mmoles/gm	Std. Dev	[OH]t/[OH]0	ln([OH]t/[OH]o)	14.9-[OH]t
0	0	0	0	0	1	0	14.9
900	8.133654067	0.68000034	0.9569	0.08	0.935	-0.066	13.9431
1800	9.184254592	0.68000034	1.0805	0.08	0.927	-0.07529	13.8195
2700	10.49665525	0.08500004	1.2349	0.01	0.917	-0.08652	13.6651
3600	11.31945566	1.10500055	1.3317	0.13	0.91	-0.09362	13.5683
4500	11.93655597	2.12500106	1.4043	0.25	0.905	-0.09899	13.4957
5400	12.57575629	1.78500089	1.4795	0.21	0.9	-0.1045	13.4205
6300	13.23110662	1.44500072	1.5566	0.17	0.895	-0.1163	13.3434
7200	14.31060716	1.1900006	1.6836	0.14	0.887	-0.1199	13.2164
8100	14.98380749	1.78500089	1.7628	0.21	0.881	-0.1259	13.1372
9000	15.44875772	1.27500064	1.8175	0.15	0.878	-0.13	13.0825
9900	16.12195806	1.36000068	1.8967	0.16	0.872	-0.1361	13.0033
10800	16.64385832	0.68000034	1.9581	0.08	0.868	-0.1408	12.9419
12600	17.38165869	0.76500038	2.0449	0.09	0.856	-0.1476	12.8551
14400	18.22570911	0.85000043	2.1442	0.1	0.852	-0.1553	12.7558
16200	18.68385934	0.93500047	2.1981	0.11	0.842	-0.1596	12.7019
18000	19.99456	1.02000051	2.3523	0.12	0.836	-0.1718	12.5477
19800	20.70516035	2.04000102	2.4359	0.24	0.829	-0.1785	12.4641
21600	21.54326077	1.27500064	2.5345	0.15	0.815	-0.1864	12.3655
23400	23.32571166	1.27500064	2.7442	0.15	0.683	-0.2035	12.1558
25200							

Table 1.63: Corsican pine samples modified with valeric anhydride at 120^{0}C.

Time(sec)	WPG (%)	Std. Dev	mmoles/gm	Std. Dev	[OH]t/[OH]0	ln([OH]t/[OH]o)	14.9-[OH]t
0	0	0	0	0	1	0	14.9
900	8.298554149	0.17000009	0.9763	0.02	0.934	-0.06779	13.9237
1800	10.48815524	0.76500038	1.2339	0.09	0.917	-0.08646	13.6661
2700	12.63610632	0.85000043	1.4866	0.1	0.9	-0.1051	13.4134
3600	13.09085655	0.85000043	1.5401	0.1	0.896	-0.1091	13.3599
4500	14.98720749	0.85000043	1.7632	0.1	0.881	-0.126	13.1368
5400	16.84700842	1.27500064	1.982	0.15	0.866	-0.1428	12.918
6300	18.08630904	1.1900006	2.1278	0.14	0.857	-0.1541	12.7722
7200	18.32770916	1.44500072	2.1562	0.17	0.855	-0.1564	12.7438
8100	19.2091596	0.76500038	2.2599	0.09	0.848	-0.1645	12.6401
9000	21.994611	1.87000094	2.5876	0.22	0.826	-0.1908	12.3124
9900	22.16206108	1.95500098	2.6073	0.23	0.825	-0.1924	12.2927
10800	23.70481185	2.12500106	2.7888	0.25	0.812	-0.2072	12.1112
12600	24.36186218	2.63500132	2.8661	0.31	0.807	-0.2136	12.0339
14400	27.05296353	2.55000128	3.1827	0.3	0.786	-0.2403	11.7173
16200	28.72066436	1.27500064	3.3789	0.15	0.773	-0.2573	11.5211
18000	29.33521467	1.44500072	3.4512	0.17	0.768	-0.2635	11.4488
19800	31.51971576	1.78500089	3.7082	0.21	0.751	-0.2863	11.1918
21600	32.2073661	0.93500047	3.7891	0.11	0.745	-0.2935	11.1109
23400							
25200							

Table 1.64: Corsican pine samples modified with hexanoic anhydride at 60^{0}C.

Time(sec)	WPG (%)	Std. Dev	mmoles/gm	Std. Dev	[OH]t/[OH]0	ln([OH]t/[OH]o)	14.9-[OH]t
0	0	0	0	0	1	0	14.9
900	4.60647	1.18800001	0.4653	0.12	0.9687	-0.031800313	14.4347
1800	7.444800001	1.08900001	0.752	0.11	0.9495	-0.051819749	14.148
2700	8.410050001	0.89100001	0.8495	0.09	0.9429	-0.058795047	14.0505
3600	9.371340001	0.79200001	0.9466	0.08	0.9364	-0.065712543	13.9534
4500	10.81971	1.18800001	1.0929	0.12	0.9266	-0.076233306	13.8071
5400	12.0879	1.18800001	1.221	0.12	0.918	-0.085557888	13.679
6300	13.38084	1.48500001	1.3516	0.15	0.9092	-0.095190187	13.5484
7200	13.81644	1.38600001	1.3956	0.14	0.9063	-0.098384902	13.5044
8100	14.39559	1.38600001	1.4541	0.14	0.9024	-0.102697398	13.4459
9000	16.58349	0.79200001	1.6751	0.08	0.8875	-0.119346758	13.2249
9900	16.72209	0.495	1.6891	0.05	0.8866	-0.120361357	13.2109
10800	18.01008	1.08900001	1.8192	0.11	0.8779	-0.130222587	13.0808
12600	19.68516	1.08900001	1.9884	0.11	0.8665	-0.14329317	12.9116
14400	20.79099	2.07900002	2.1001	0.21	0.859	-0.151986357	12.7999
16200	22.11858	1.38600001	2.2342	0.14	0.85	-0.162518929	12.6658
18000	25.08264	2.17800002	2.5336	0.22	0.8299	-0.186450067	12.3664
19800	24.56982	1.08900001	2.4818	0.11	0.8334	-0.18224156	12.4182
21600	26.66466	1.38600001	2.6934	0.14	0.8192	-0.199427025	12.2066
23400	28.30707	2.17800002	2.8593	0.22	0.808	-0.21319322	12.0407
25200	30.11976	2.17800002	3.0424	0.22	0.7958	-0.228407381	11.8576

Table 1.65: Corsican pine samples modified with hexanoic anhydride at 70^0C.

Time(sec)	WPG (%)	Std. Dev	mmoles/gm	Std. Dev	[OH]t/[OH]0	ln([OH]t/[OH]o)	14.9-[OH]t
0	0	0	0	0	1	0	14.9
900	7.273530001	0.89100001	0.7347	0.09	0.9506	-0.050661915	14.1653
1800	8.184330001	0.79200001	0.8267	0.08	0.9445	-0.057099592	14.0733
2700	9.111960001	0.99000001	0.9204	0.1	0.9382	-0.063792133	13.9796
3600	10.05642	1.08900001	1.0158	0.11	0.9318	-0.07063708	13.8842
4500	10.6623	1.18800001	1.077	0.12	0.9277	-0.075046874	13.823
5400	11.16819	0.99000001	1.1281	0.1	0.9242	-0.078826781	13.7719
6300	11.44737	0.99000001	1.1563	0.1	0.9223	-0.080884729	13.7437
7200	12.28293	0.495	1.2407	0.05	0.9167	-0.086975014	13.6593
8100	13.13037	1.18800001	1.3263	0.12	0.9109	-0.093322157	13.5737
9000	13.75803	1.48500001	1.3897	0.15	0.9067	-0.097943644	13.5103
9900	14.17185	1.68300002	1.4315	0.17	0.9039	-0.101036544	13.4685
10800	14.6421	1.78200002	1.479	0.18	0.9007	-0.10458304	13.421
12600	15.39945	0.79200001	1.5555	0.08	0.8956	-0.110261394	13.3445
14400	16.32213	0.99000001	1.6487	0.1	0.8893	-0.117320643	13.2513
16200	16.84188	2.17800002	1.7012	0.22	0.8858	-0.121264087	13.1988
18000	17.85168	2.07900002	1.8032	0.21	0.8789	-0.129084153	13.0968
19800	18.40113	2.17800002	1.8587	0.22	0.8752	-0.133302847	13.0413
21600	19.28124	0.79200001	1.9476	0.08	0.8692	-0.140182031	12.9524
23400	20.22471	0.99000001	2.0429	0.1	0.8628	-0.147572364	12.8571
25200							

Table 1.66: Corsican pine samples modified with hexanoic anhydride at 80^0C.

Time(sec)	WPG (%)	Std. Dev	mmoles/gm	Std. Dev	[OH]t/[OH]0	ln([OH]t/[OH]o)	14.9-[OH]t
0	0	0	0	0	1	0	14.9
900	7.935840001	0.99000001	0.8016	0.1	0.9461	-0.055407007	14.0984
1800	9.238680001	0.99000001	0.9332	0.1	0.9373	-0.064751877	13.9668
2700	10.15146	0.79200001	1.0254	0.08	0.9311	-0.071388596	13.8746
3600	10.80585	1.18800001	1.0915	0.12	0.9267	-0.07612539	13.8085
4500	11.49687	1.28700001	1.1613	0.13	0.922	-0.081210055	13.7387
5400	11.70873	1.98000002	1.1827	0.2	0.9206	-0.082729648	13.7173
6300	12.16413	1.08900001	1.2287	0.11	0.9175	-0.086102699	13.6713
7200	12.95217	1.18800001	1.3083	0.12	0.9121	-0.092005646	13.5917
8100	13.57785	0.79200001	1.3715	0.08	0.9079	-0.096621039	13.5285
9000	14.25303	0.89100001	1.4397	0.09	0.9033	-0.101700555	13.4603
9900	14.65101	1.08900001	1.4799	0.11	0.9006	-0.104694071	13.4201
10800	15.34401	1.08900001	1.5499	0.11	0.8959	-0.109926479	13.3501
12600	15.98751	1.48500001	1.6149	0.15	0.8916	-0.114737677	13.2851
14400	16.7409	1.08900001	1.691	0.11	0.8865	-0.120474153	13.209
16200	17.70813	0.79200001	1.7887	0.08	0.8799	-0.127947014	13.1113
18000	18.37638	2.17800002	1.8562	0.22	0.8754	-0.133074354	13.0438
19800	18.90108	1.98000002	1.9092	0.2	0.8718	-0.137195239	12.9908
21600	20.03067	1.78200002	2.0233	0.18	0.8642	-0.145951055	12.8767
23400	21.2949	0.69300001	2.151	0.07	0.8556	-0.155952302	12.749
25200							

Table 1.67: Corsican pine samples modified with hexanoic anhydride at 90^0C.

Time(sec)	WPG (%)	Std. Dev	mmoles/gm	Std. Dev	[OH]t/[OH]0	ln([OH]t/[OH]o)	14.9-[OH]t
0	0	0	0	0	1	0	14.9
900	8.458560001	0.495	0.8544	0.05	0.9426	-0.059113264	14.0456
1800	9.844560001	0.89100001	0.9944	0.09	0.9332	-0.069135739	13.9056
2700	10.85535	0.99000001	1.0965	0.1	0.9264	-0.076449172	13.8035
3600	10.092456	1.08900001	1.01944	0.11	0.9198	-0.083599024	13.88056
4500	12.44232	1.18800001	1.2568	0.12	0.9156	-0.088175691	13.6432
5400	13.60557	0.495	1.3743	0.05	0.9077	-0.096841351	13.5257
6300	14.48667	0.79200001	1.4633	0.08	0.9017	-0.103473408	13.4367
7200	15.53112	0.69300001	1.5688	0.07	0.8974	-0.108253585	13.3312
8100	16.83891	1.68300002	1.7009	0.17	0.8947	-0.111266812	13.1991
9000	17.64378	1.48500001	1.7822	0.15	0.8858	-0.121264087	13.1178
9900	18.34074	1.28700001	1.8526	0.13	0.8803	-0.127492521	13.0474
10800	19.81584	1.78200002	2.0016	0.18	0.875	-0.133531393	12.8984
12600	20.84049	1.98000002	2.1051	0.2	0.8656	-0.144332371	12.7949
14400	21.73644	2.07900002	2.1956	0.21	0.8587	-0.152335661	12.7044
16200	22.3344	1.48500001	2.256	0.15	0.8526	-0.159464775	12.644
18000	23.79762	0.297	2.4038	0.03	0.8485	-0.164285194	12.4962
19800	24.50547	1.38600001	2.4753	0.14	0.8386	-0.176021444	12.4247
21600	25.8489	1.38600001	2.611	0.14	0.8338	-0.181761714	12.289
23400	21.2949	1.08900001	2.151	0.11	0.8247	-0.192735595	12.749
25200							

Table 1.68: Corsican pine samples modified with hexanoic anhydride at 100^0C.

Time(sec)	WPG (%)	Std. Dev	mmoles/gm	Std. Dev	[OH]t/[OH]0	ln([OH]t/[OH]o)	14.9-[OH]t
0	0	0	0	0	1	0	14.9
900	8.227890001	0.99000001	0.8311	0.1	0.9442	-0.057417271	14.0689
1800	9.987120001	1.08900001	1.0088	0.11	0.9322	-0.070207895	13.8912
2700	11.54142	0.495	1.1658	0.05	0.9217	-0.081535488	13.7342
3600	12.7611	0.79200001	1.289	0.08	0.9134	-0.090581378	13.611
4500	13.22442	1.98000002	1.3358	0.2	0.9103	-0.093981063	13.5642
5400	14.03523	2.07900002	1.4177	0.21	0.9048	-0.100041354	13.4823
6300	15.45984	1.78200002	1.5616	0.18	0.8951	-0.110819835	13.3384
7200	16.40232	1.88100002	1.6568	0.19	0.8887	-0.117995558	13.2432
8100	17.16165	1.48500001	1.7335	0.15	0.8836	-0.123750807	13.1665
9000	18.02295	2.07900002	1.8205	0.21	0.8778	-0.130336502	13.0795
9900	19.4832	1.08900001	1.968	0.11	0.8679	-0.141678778	12.932
10800	20.5425	1.48500001	2.075	0.15	0.8607	-0.150009267	12.825
12600	21.67506	1.78200002	2.1894	0.18	0.853	-0.158995731	12.7106
14400	22.74228	1.38600001	2.2972	0.14	0.8458	-0.167472354	12.6028
16200	23.63229	2.07900002	2.3871	0.21	0.8397	-0.174710594	12.5129
18000	25.04304	1.98000002	2.5296	0.2	0.8302	-0.186088643	12.3704
19800	25.88256	1.58400002	2.6144	0.16	0.8245	-0.192978137	12.2856
21600	26.42706	1.78200002	2.6694	0.18	0.8208	-0.197475805	12.2306
23400	30.31974	1.08900001	3.0626	0.11	0.7944	-0.230168166	11.8374
25200							

Table 1.69: Corsican pine samples modified with hexanoic anhydride at 110^{0}C.

Time(sec)	WPG (%)	Std. Dev	mmoles/gm	Std. Dev	[OH]t/[OH]0	ln([OH]t/[OH]o)	14.9-[OH]t
0	0	0	0	0	1	0	14.9
900	8.680320001	0.89100001	0.8768	0.09	0.9411	-0.060705875	14.0232
1800	10.33362	1.08900001	1.0438	0.11	0.9299	-0.072678225	13.8562
2700	11.76813	1.48500001	1.1887	0.15	0.9202	-0.083164241	13.7113
3600	12.4245	1.38600001	1.255	0.14	0.9157	-0.088066479	13.645
4500	14.64408	1.88100002	1.4792	0.19	0.9007	-0.10458304	13.4208
5400	15.76278	2.07900002	1.5922	0.21	0.8931	-0.113056722	13.3078
6300	16.77654	1.98000002	1.6946	0.2	0.8862	-0.12081262	13.2054
7200	17.91999	1.98000002	1.8101	0.2	0.8785	-0.129539371	13.0899
8100	18.79713	2.27700002	1.8987	0.23	0.8725	-0.136392625	13.0013
9000	19.86435	2.17800002	2.0065	0.22	0.8653	-0.144679011	12.8935
9900	20.06532	0.495	2.0268	0.05	0.8643	-0.145835348	12.8732
10800	21.3246	0.89100001	2.154	0.09	0.8554	-0.156186083	12.746
12600	22.83534	0.79200001	2.3066	0.08	0.8451	-0.168300315	12.5934
14400	24.62328	0.79200001	2.4872	0.08	0.833	-0.182721637	12.4128
16200	26.16471	1.48500001	2.6429	0.15	0.8226	-0.195285223	12.2571
18000	27.1656	1.58400002	2.744	0.16	0.8158	-0.203586052	12.156
19800	28.28628	1.68300002	2.8572	0.17	0.8082	-0.212945726	12.0428
21600	29.65248	2.17800002	2.9952	0.22	0.7989	-0.224519497	11.9048
23400	30.31974	1.78200002	3.0626	0.18	0.7944	-0.230168166	11.8374
25200							

Table 1.70: Corsican pine samples modified with hexanoic anhydride at 120^0C.

Time(sec)	WPG (%)	Std. Dev	mmoles/gm	Std. Dev	[OH]t/[OH]0	ln([OH]t/[OH]o)	14.9-[OH]t
0	0	0	0	0	1	0	14.9
900	8.780310001	0.99000001	0.8869	0.1	0.9404	-0.061449962	14.0131
1800	10.59894	1.18800001	1.0706	0.12	0.9281	-0.074615793	13.8294
2700	11.91762	1.48500001	1.2038	0.15	0.9192	-0.084251552	13.6962
3600	12.02058	1.78200002	1.2142	0.18	0.9185	-0.085013374	13.6858
4500	13.80456	2.17800002	1.3944	0.22	0.9064	-0.098274569	13.5056
5400	15.19254	0.79200001	1.5346	0.08	0.897	-0.108699417	13.3654
6300	16.137	0.89100001	1.63	0.09	0.8823	-0.125223145	13.27
7200	17.35866	2.17800002	1.7534	0.22	0.8721	-0.136851183	13.1466
8100	18.86346	1.08900001	1.9054	0.11	0.8586	-0.152452123	12.9946
9000	20.81871	1.88100002	2.1029	0.19	0.8507	-0.161695739	12.7971
9900	23.60556	1.78200002	2.3844	0.18	0.8399	-0.174472442	12.5156
10800	24.73317	2.17800002	2.4983	0.22	0.8323	-0.183562326	12.4017
12600	26.67951	1.48500001	2.6949	0.15	0.8191	-0.199549102	12.2051
14400	28.90305	1.08900001	2.9195	0.11	0.8046	-0.217410019	11.9805
16200	29.84157	1.08900001	3.0143	0.11	0.7976	-0.22614806	11.8857
18000	32.18094	0.89100001	3.2506	0.09	0.7818	-0.246156326	11.6494
19800							
21600							
23400							
25200							

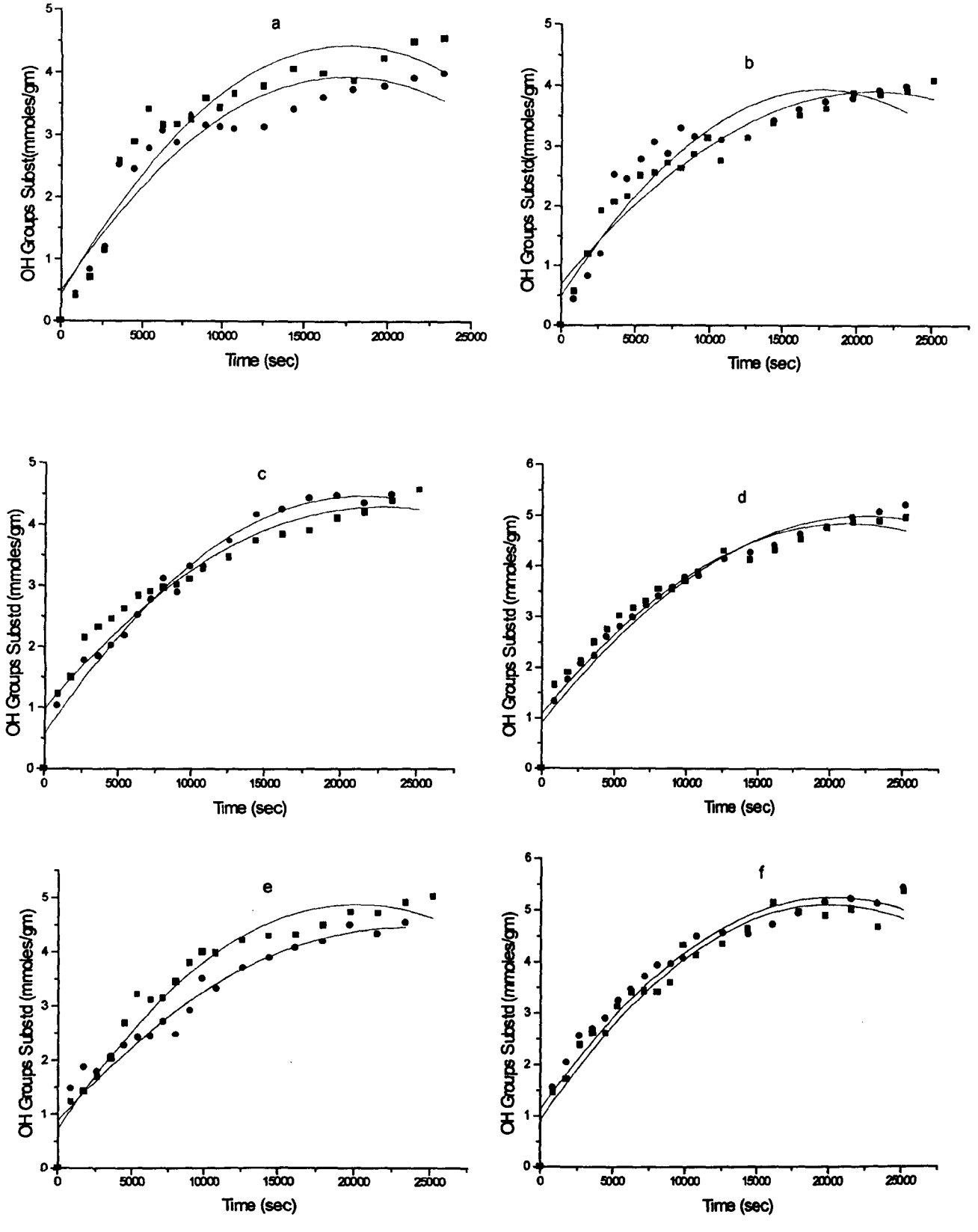


Figure A.1.1: Kinetic profile for reaction of Scots (squares) and Corsican pine (circles) sapwood with acetic anhydride at 60°C (a), 70°C (b), 80°C (c), 90°C (d), 100°C (e), 110°C (f).

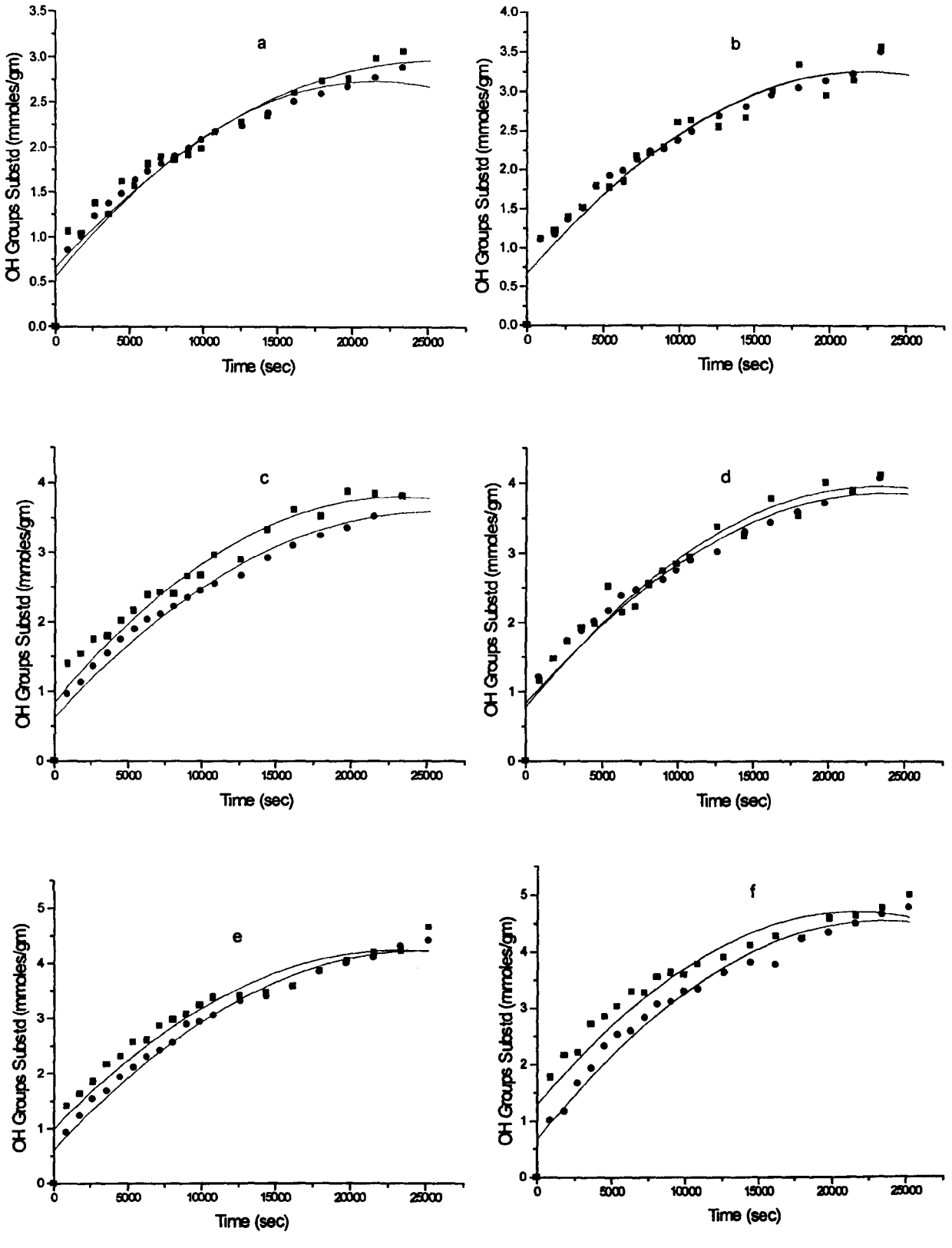


Figure A.1.2: Kinetic profile for reaction of Scots (squares) and Corsican pine (circles) sapwood with propionic anhydride at 60°C (a), 70°C (b), 80°C (c), 90°C (d), 100°C (e), 110°C (f).

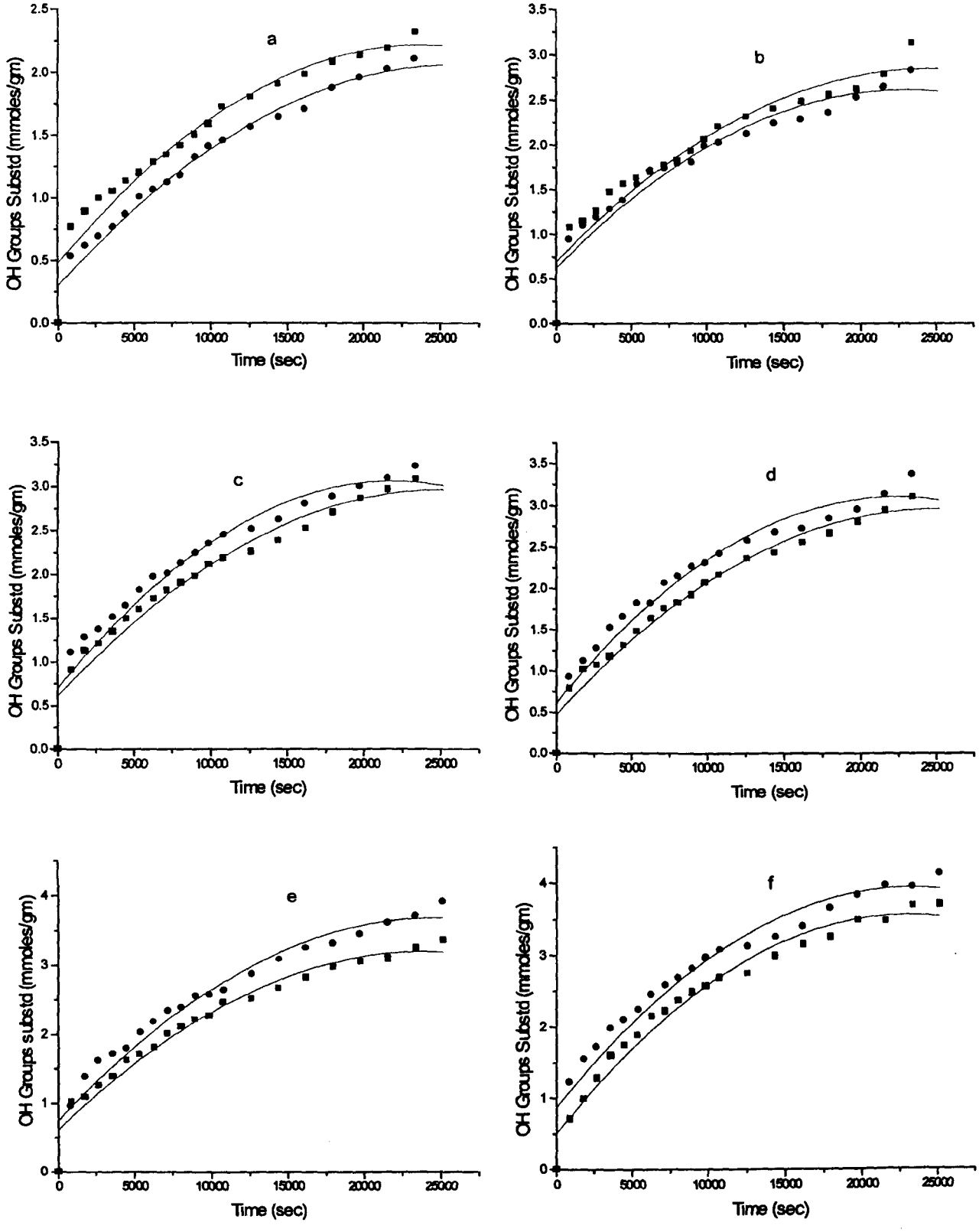


Figure A.1.3: Kinetic profile for reaction of Scots (squares) and Corsican pine (circles) sapwood with butyric anhydride at 60°C (a), 70°C (b), 80°C (c), 90°C (d), 100°C (e), 110°C (f).

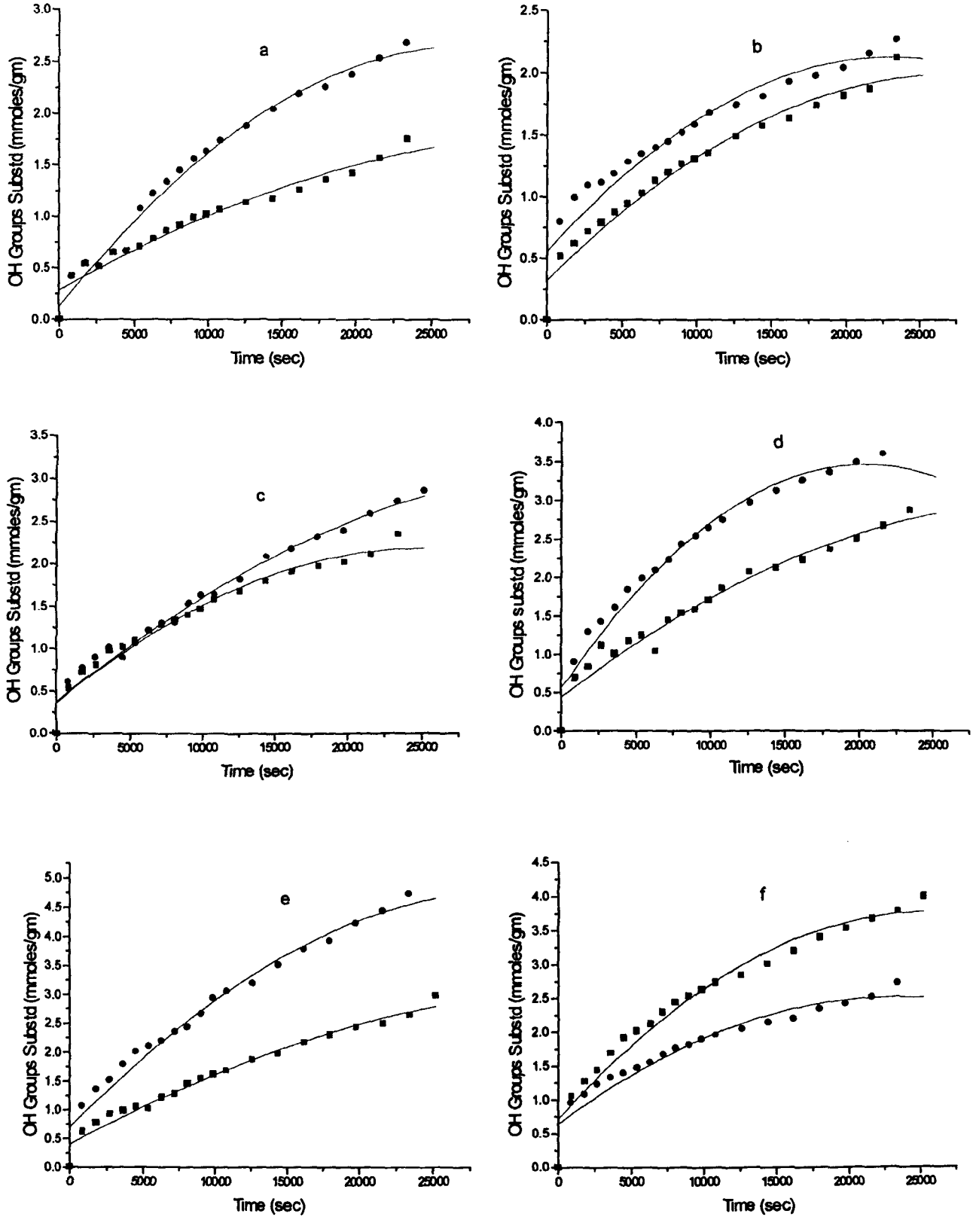


Figure A.1.4: Kinetic profile for reaction of Scots (squares) and Corsican pine (circles) sapwood with valeric anhydride at 60°C (a), 70°C (b), 80°C (c), 90°C (d), 100°C (e), 110°C (f).

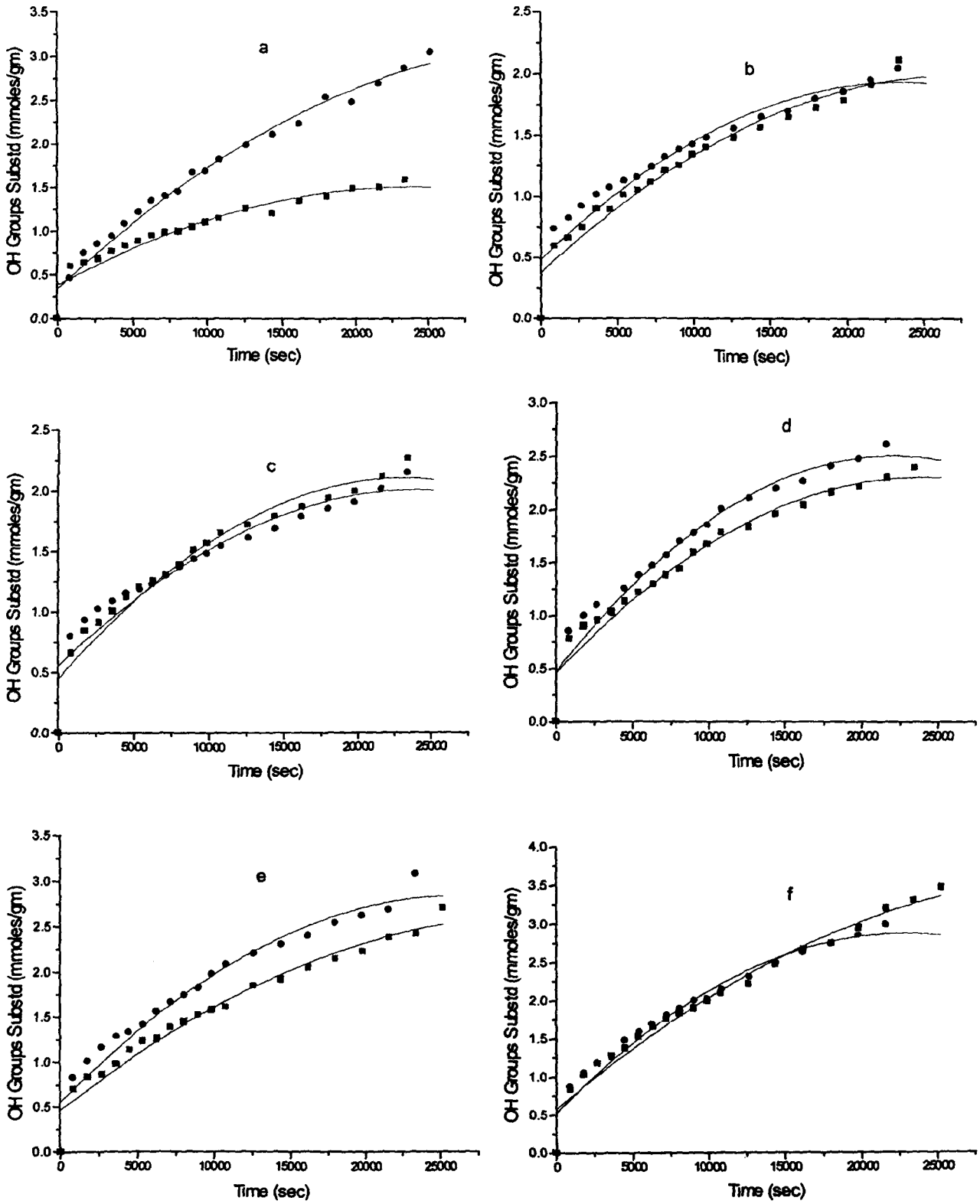


Figure A.1.5: Kinetic profile for reaction of Scots (squares) and Corsican pine (circles) sapwood with hexanoic anhydride at 60°C (a), 70°C (b), 80°C (c), 90°C (d), 100°C (e), 110°C (f).

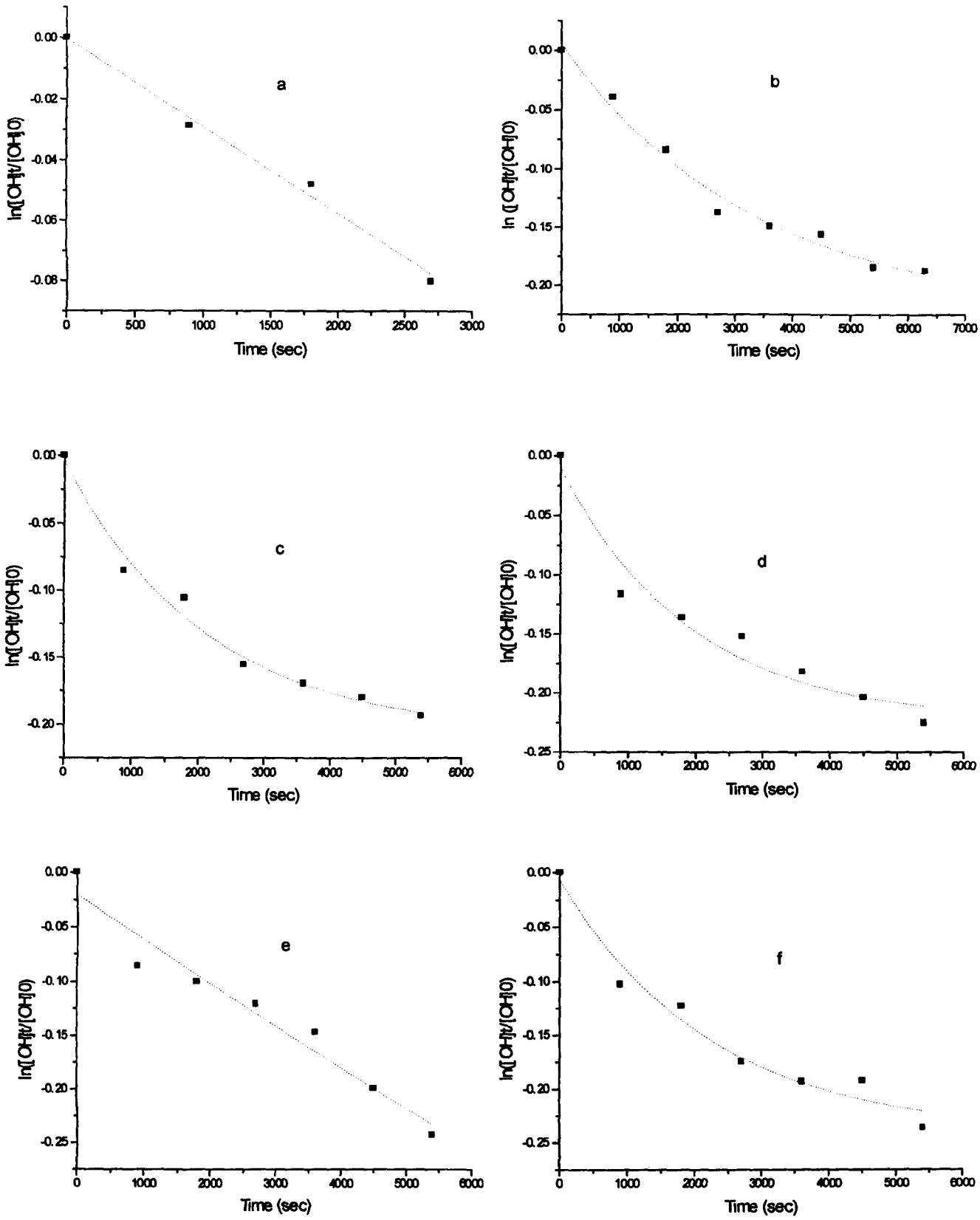


Figure A.1.6: First order kinetic plot for reaction of Scots pine sapwood with acetic anhydride at 60°C (a), 70°C (b), 80°C (c), 90°C (d), 100°C (e), 110°C (f).

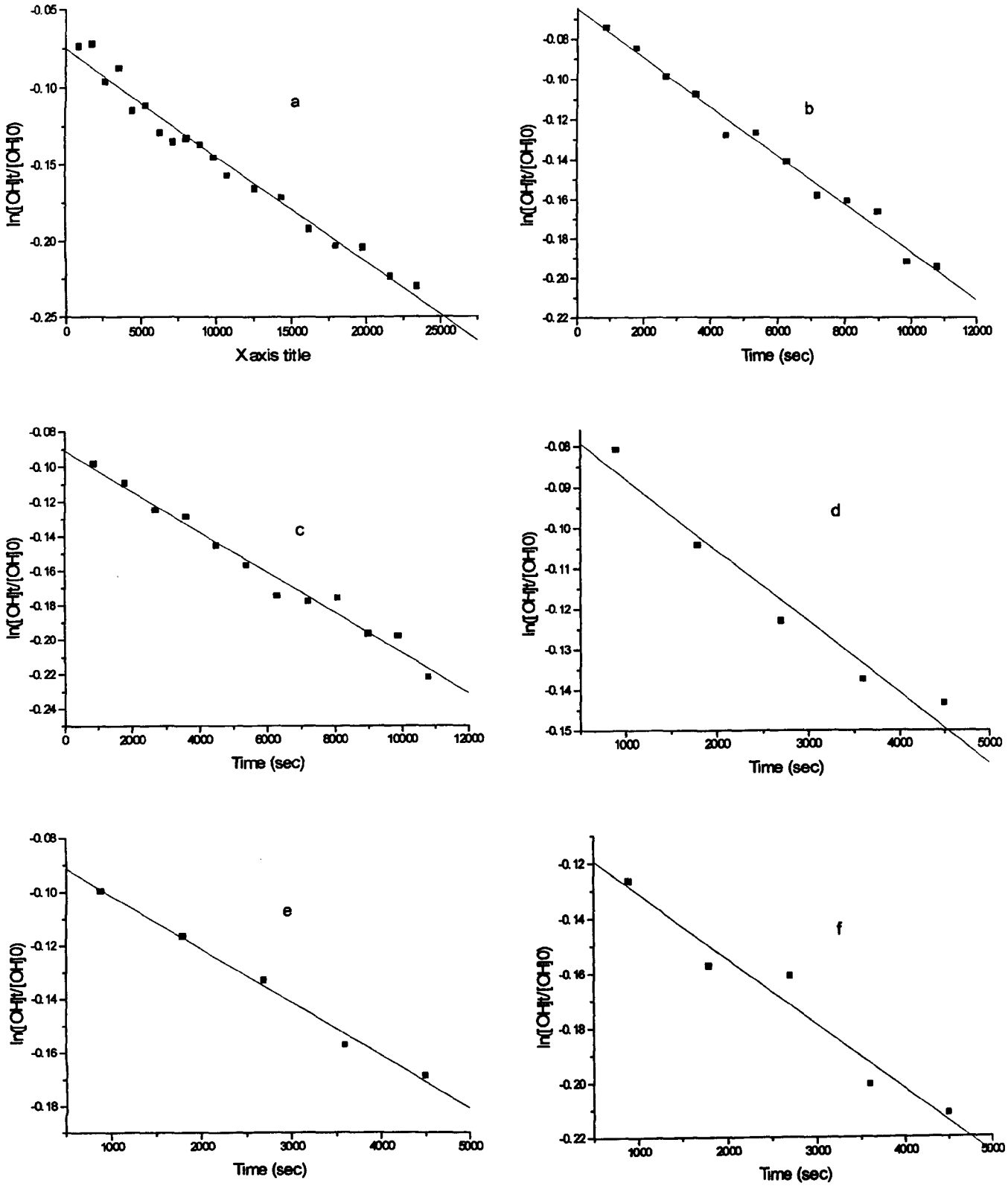


Figure A.1.7: First order kinetic plot for reaction of Scots pine sapwood with propionic anhydride at 60°C (R^2=0.98) (a), 70°C (R^2=0.99) (b), 80°C (R^2=0.98) (c), 90°C (R^2=0.99) (d), 100°C (R^2=0.99) (e), 110°C (R^2=0.97) (f).

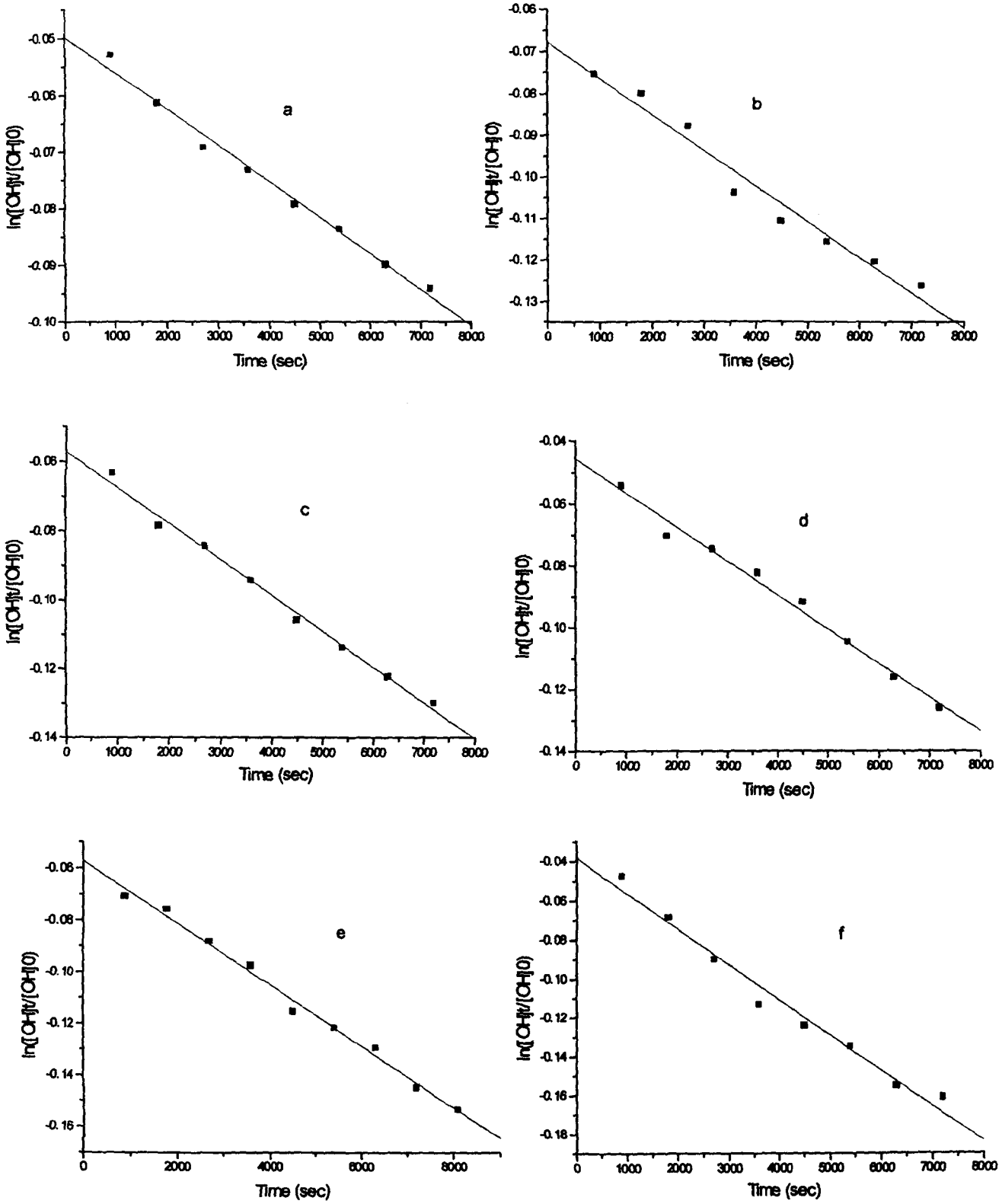


Figure A.1.8: First order kinetic plot for reaction of Scots pine sapwood with butyric anhydride at 60°C (R^2=0.99) (a), 70°C (R^2=0.98) (b), 80°C (R^2=0.99) (c), 90°C (R^2=0.99) (d), 100°C (R^2=0.99) (e), 110°C (R^2=0.98) (f).

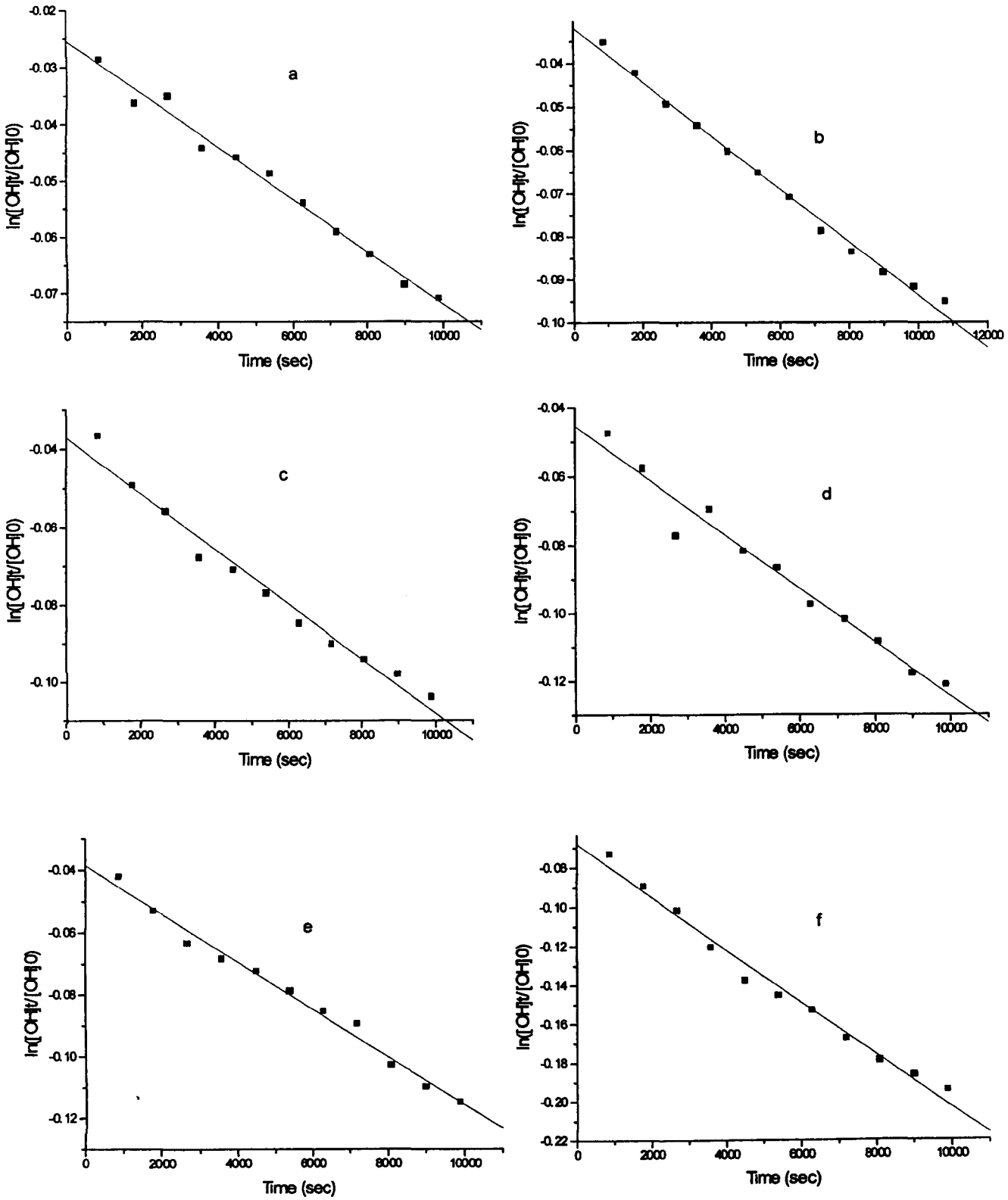


Figure A.1.9: First order kinetic plot for reaction of Scots pine sapwood with valeric anhydride at 60°C (R^2=0.99) (a), 70°C (R^2=0.99) (b), 80°C (R^2=0.98) (c), 90°C (R^2=0.98) (d), 100°C (R^2=0.99) (e), 110°C (R^2=0.99) (f).

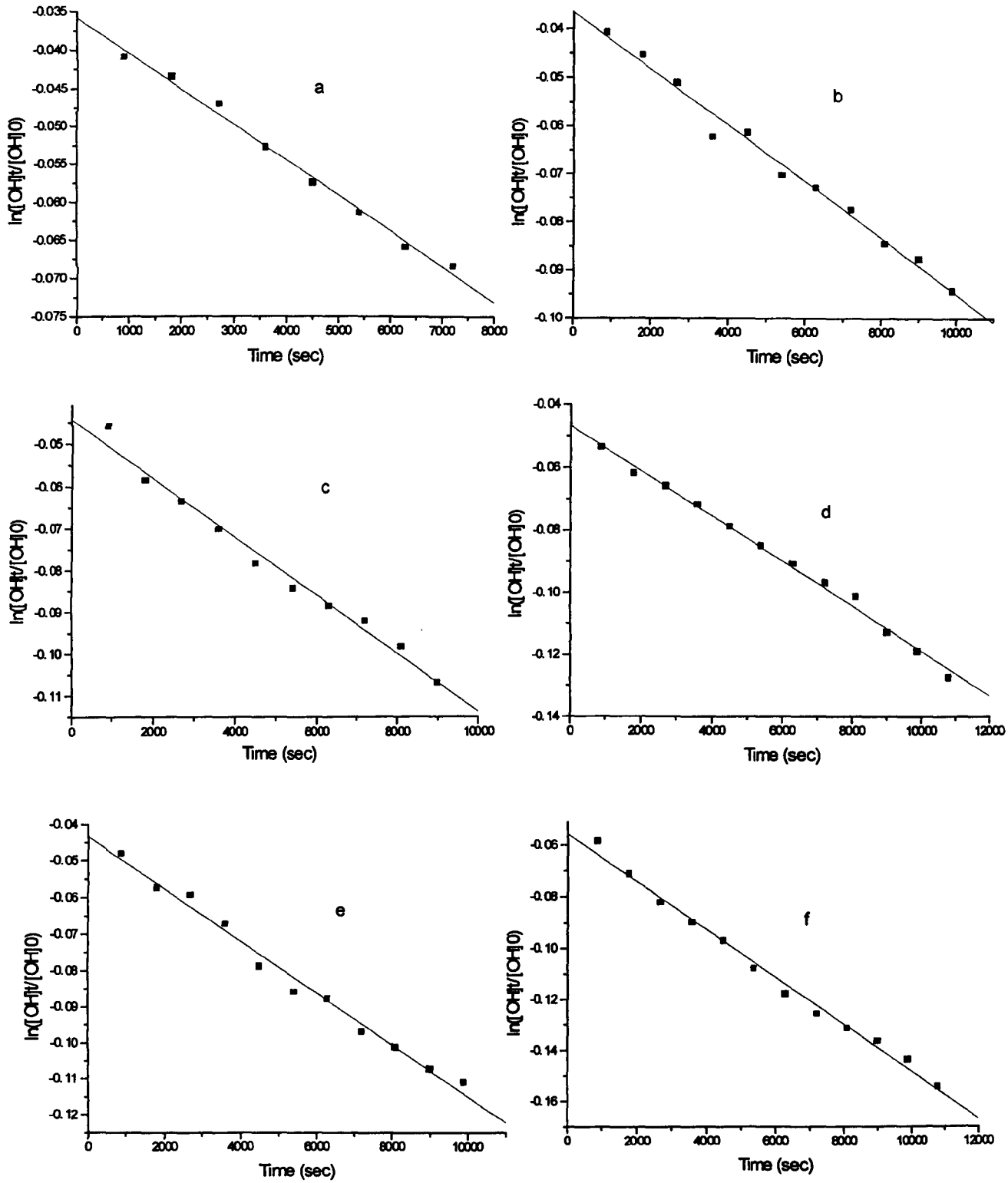


Figure A.1.10: First order kinetic plot for reaction of Scots pine sapwood with hexanoic anhydride at 60°C (R^2=0.99) (a), 70°C (R^2=0.99) (b), 80°C (R^2=0.99) (c), 90°C (R^2=0.99) (d), 100°C (R^2=0.99) (e), 110°C (R^2=0.99) (f).

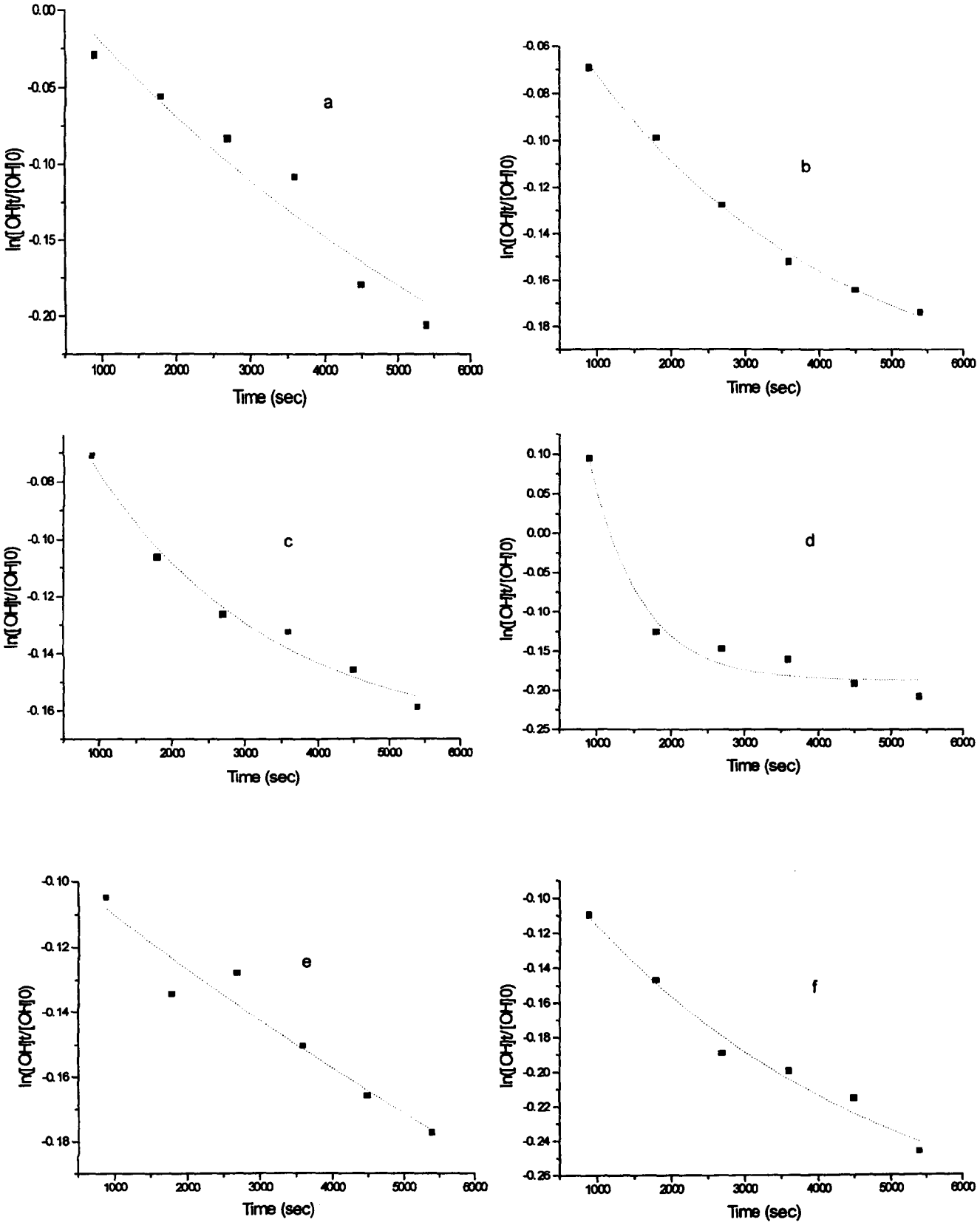


Figure A.1.11: First order kinetic plot for reaction of Corsican pine sapwood with acetic anhydride at 60°C (a), 70°C (b), 80°C (c), 90°C (d), 100°C (e), 110°C (f).

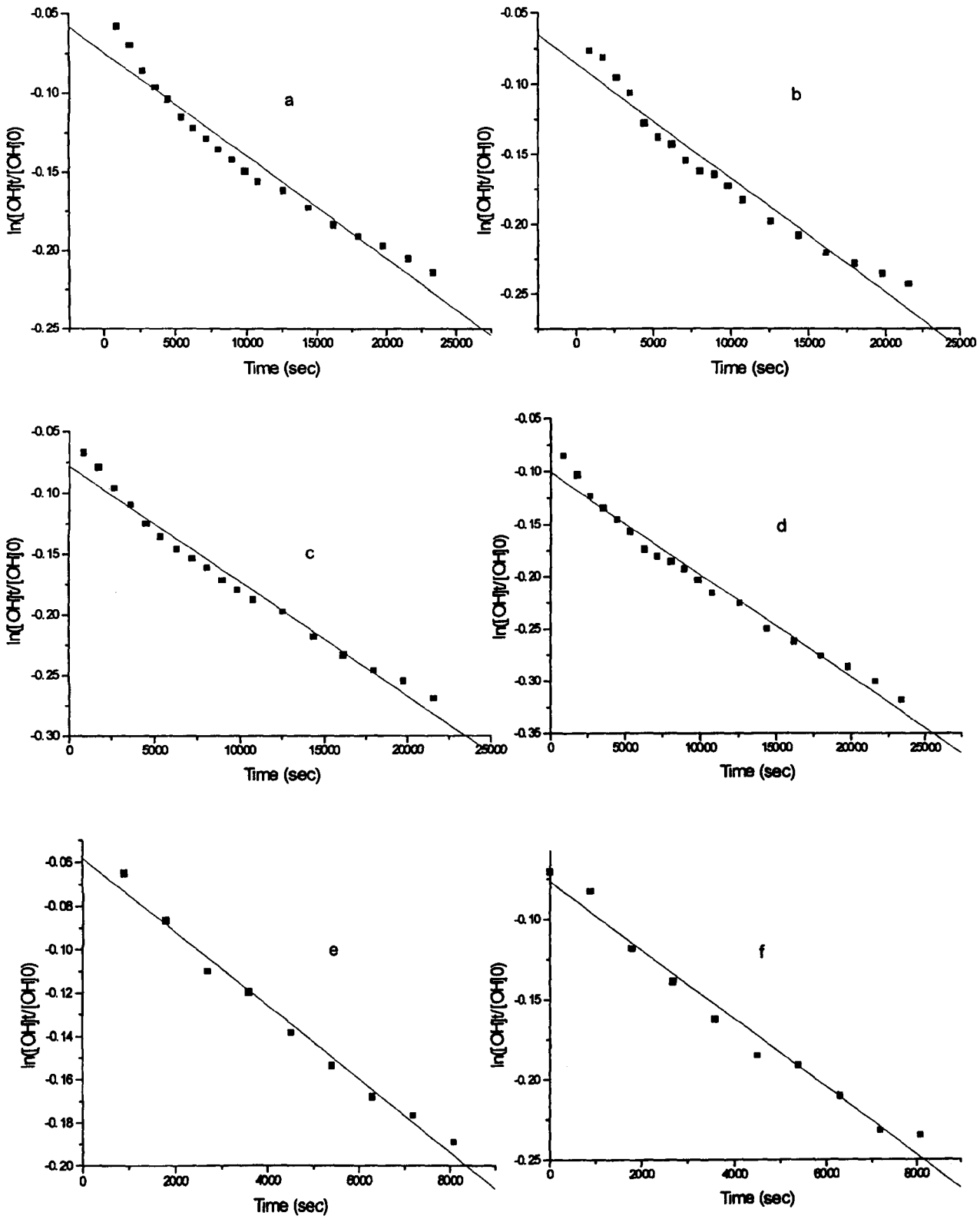


Figure A.1.12: *First order kinetic plot for reaction of Corsican pine sapwood with propionic anhydride at 60°C (R^2=0.97) (a), 70°C (R^2=0.97) (b), 80°C (R^2=0.98) (c), 90°C (R^2=0.99) (d), 100°C (R^2=0.99) (e), 110°C (R^2=0.97) (f).*

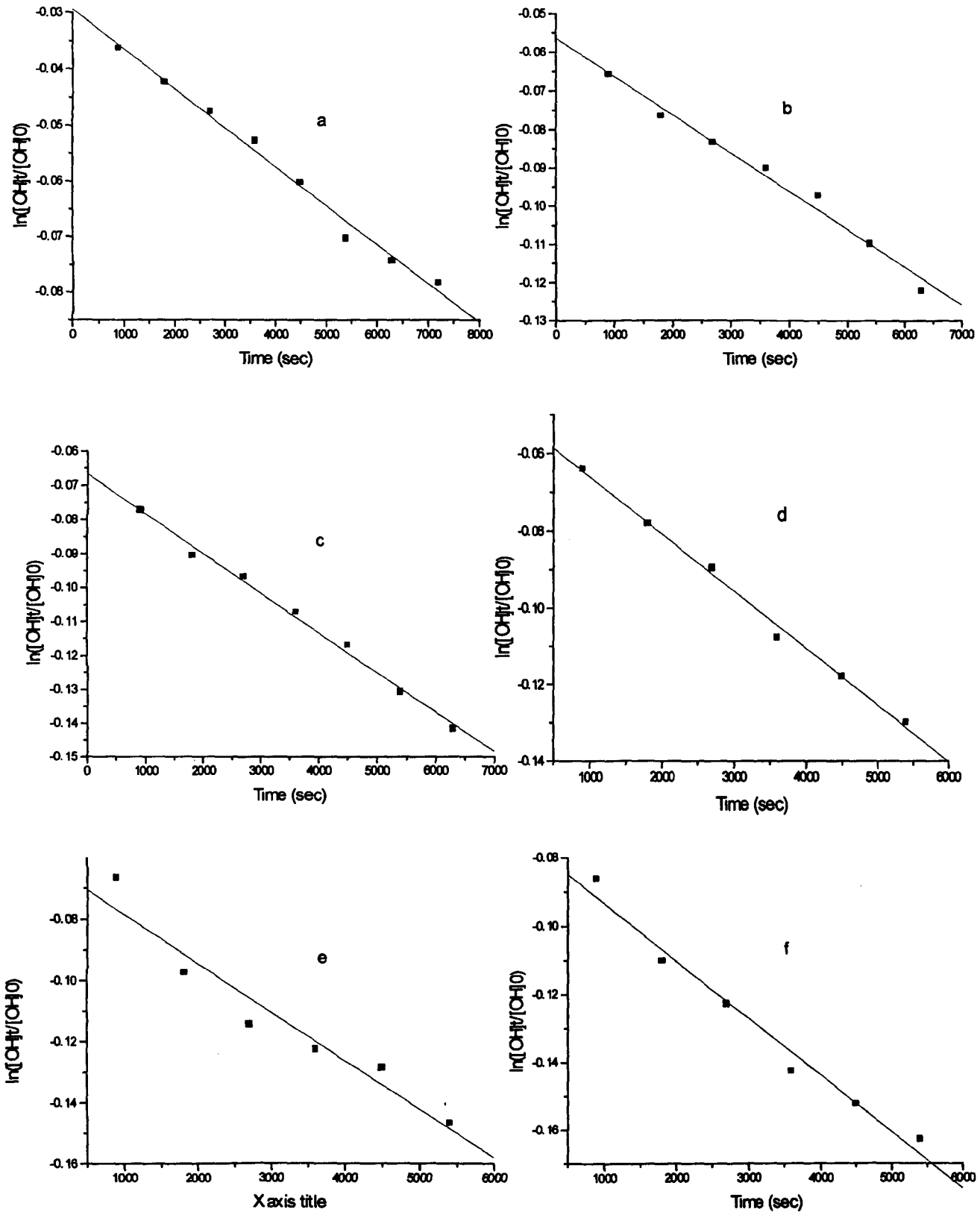


Figure A.1.13: *First order kinetic plot for reaction of Corsican pine sapwood with butyric anhydride at 60°C (R^2=0.99) (a), 70°C (R^2=0.99) (b), 80°C (R^2=0.99) (c), 90°C (R^2=0.99) (d), 100°C (R^2=0.96) (e), 110°C (R^2=0.98) (f).*

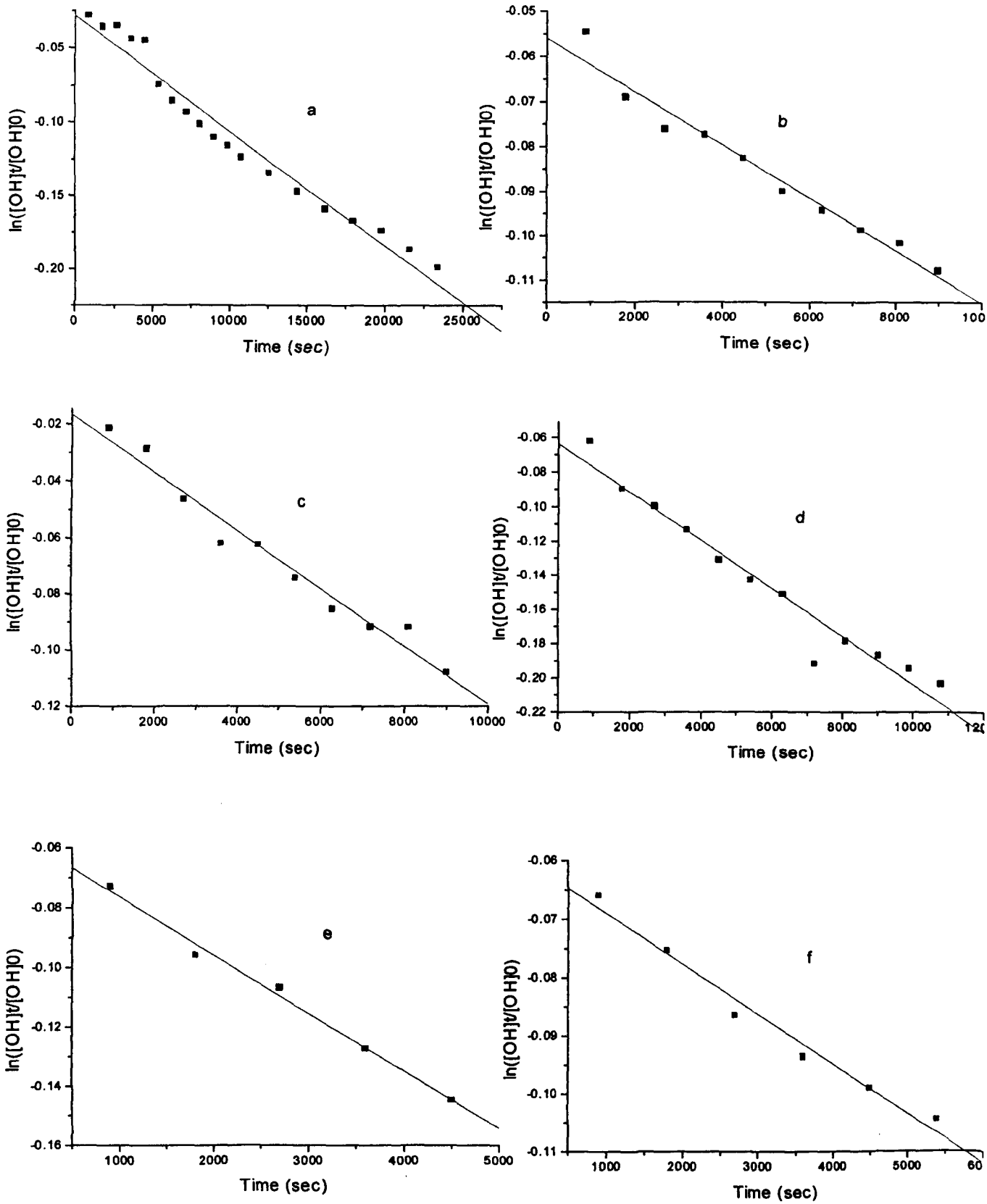


Figure A.1.14: *First order kinetic plot for reaction of Corsican pine sapwood with valeric anhydride at 60°C (R^2=0.99) (a), 70°C (R^2=0.98) (b), 80°C (R^2=0.98) (c), 90°C (R^2=0.97) (d), 100°C (R^2=0.99) (e), 110 °C (R^2=0.98) (f).*

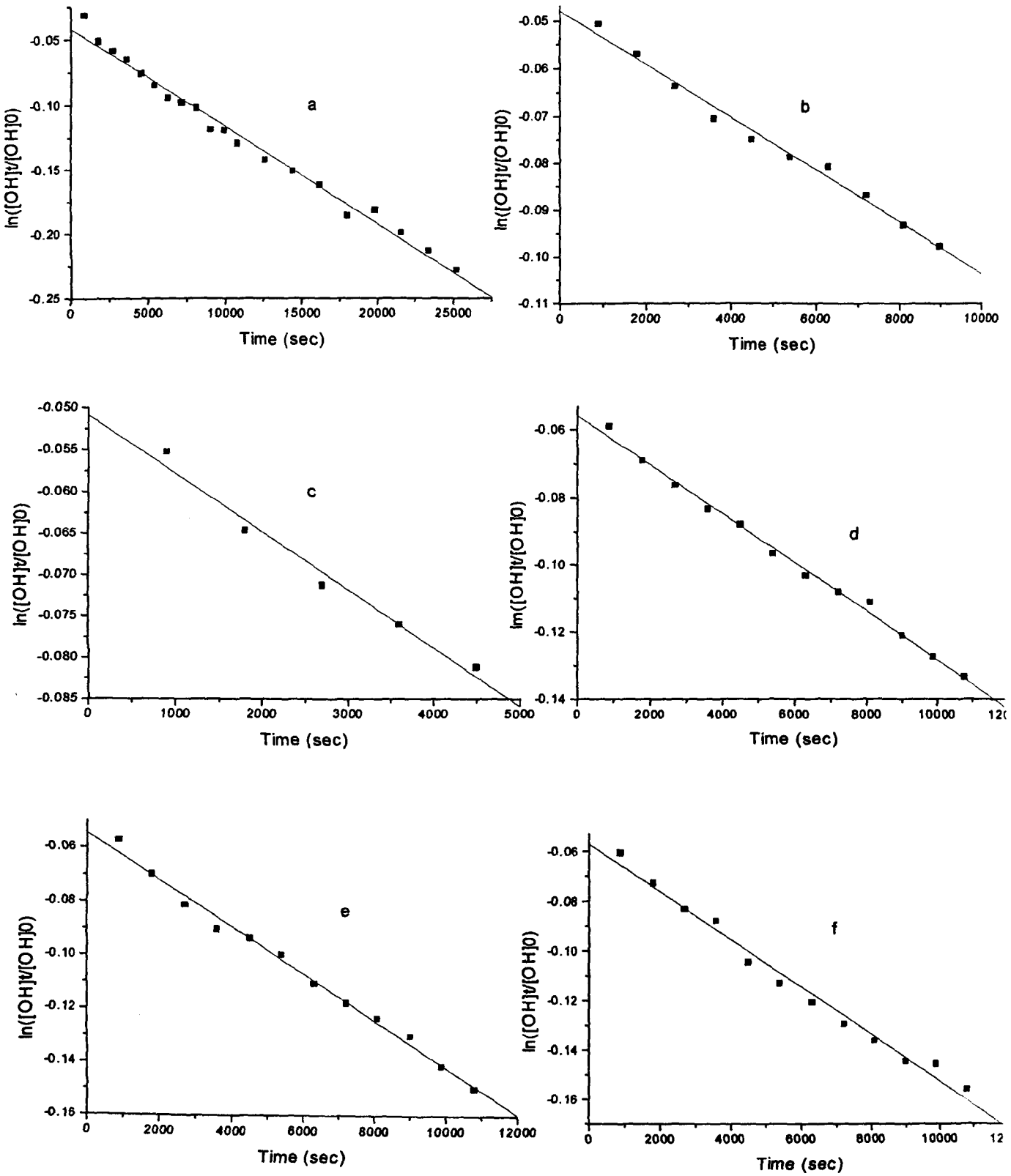


Figure A.1.15: *First order kinetic plot for reaction of Corsican pine sapwood with hexanoic anhydride at 60°C (R^2=0.98) (a), 70°C (R^2=0.99) (b), 80°C (R^2=0.98) (c), 90°C (R^2=0.99) (d), 100°C (R^2=0.99) (e), 110°C (R^2=0.99) (f).*

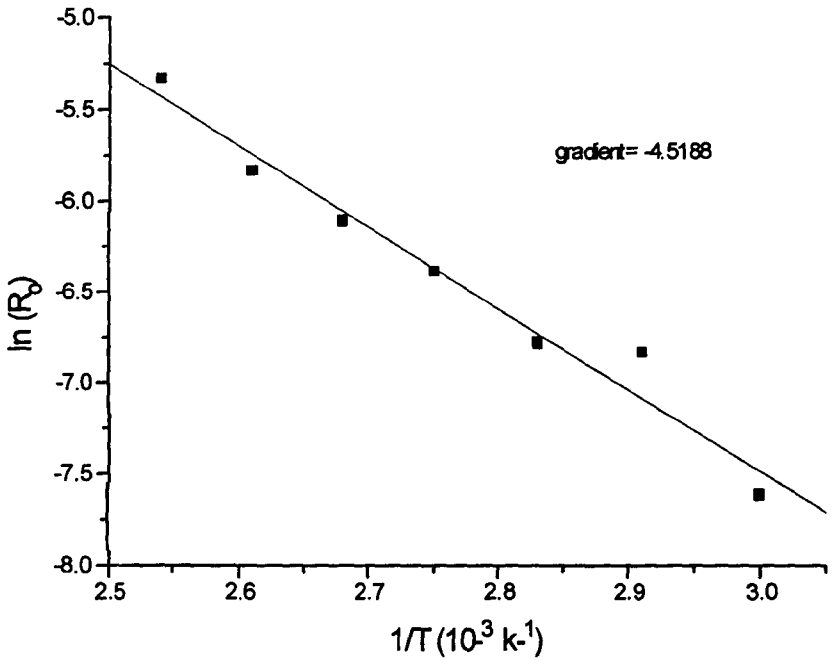


Figure A. 1.16: *Arrhenius plot for reaction of acetic anhydride with Corsican pine sapwood (R^2=0.98).*

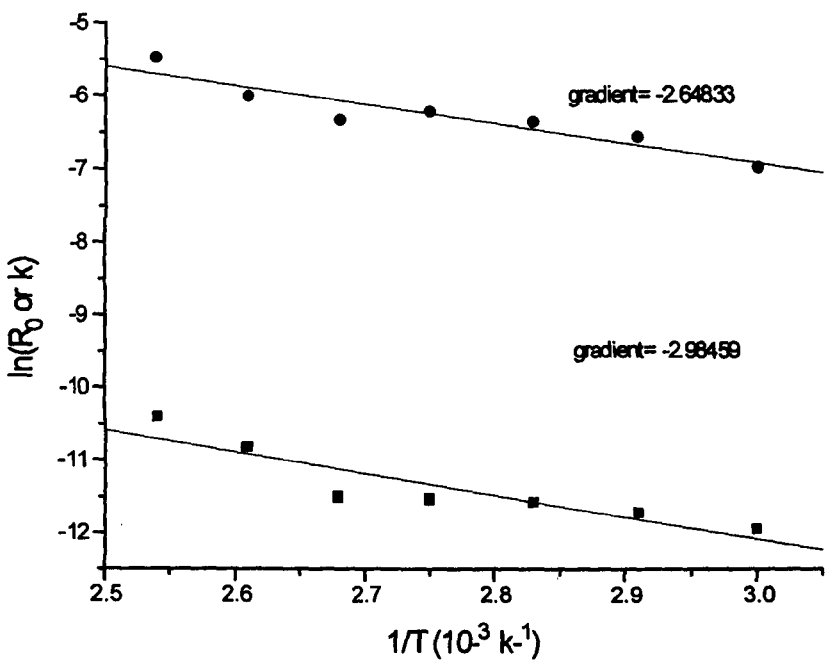


Figure A. 1.17: *Arrhenius plot for reaction of propionic anhydride with Corsican pine sapwood (circles initial rate data, R^2=0.93; squares rate constant data R^2=0.90).*

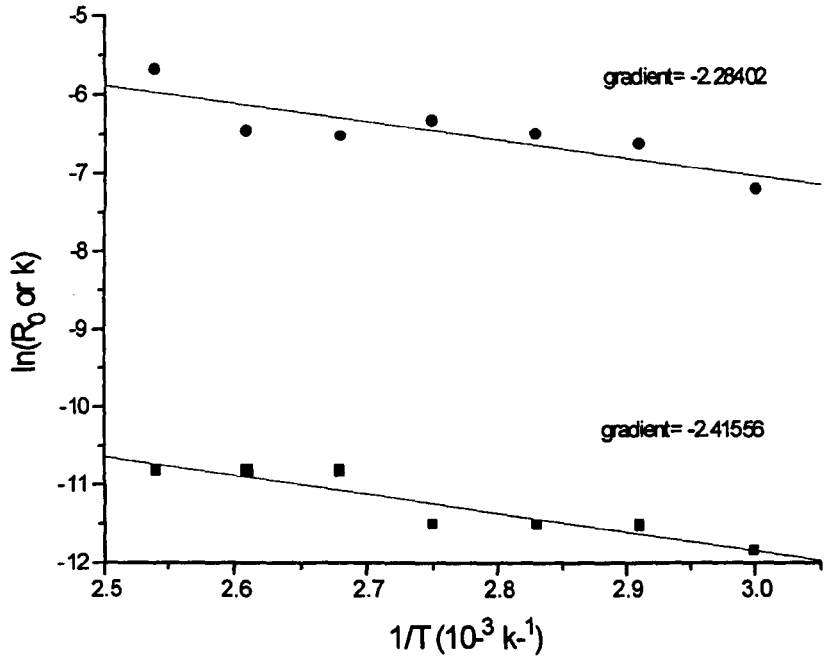


Figure A. 1.18: *Arrhenious plot for reaction of butyric anhydride with Corsican pine sapwood (circles initial rate data, R^2=0.83; squares rate constant data R^2=0.92).*

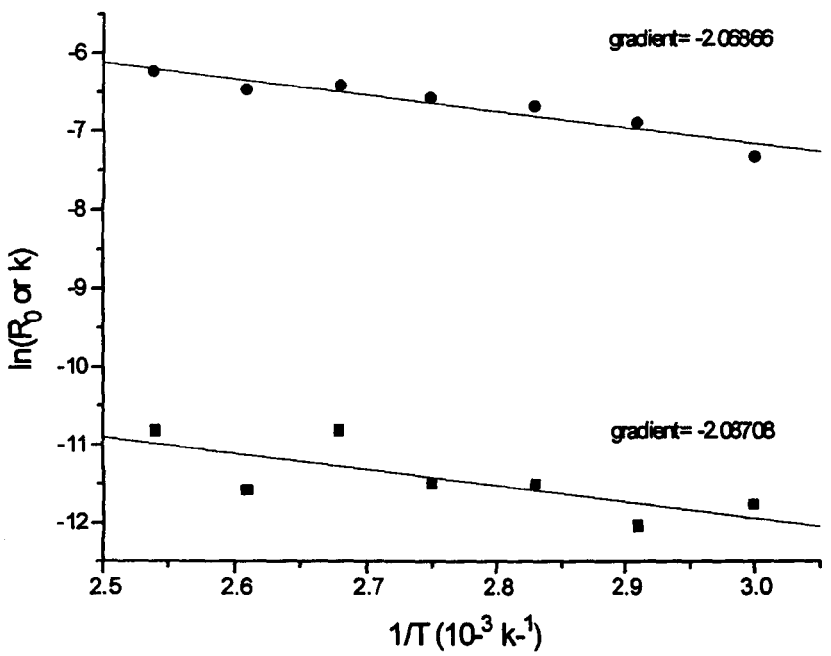


Figure A. 1.19: *Arrhenious plot for reaction of valeric anhydride with Corsican pine sapwood (circles initial rate data, R^2=0.95; squares rate constant data R^2=0.74).*

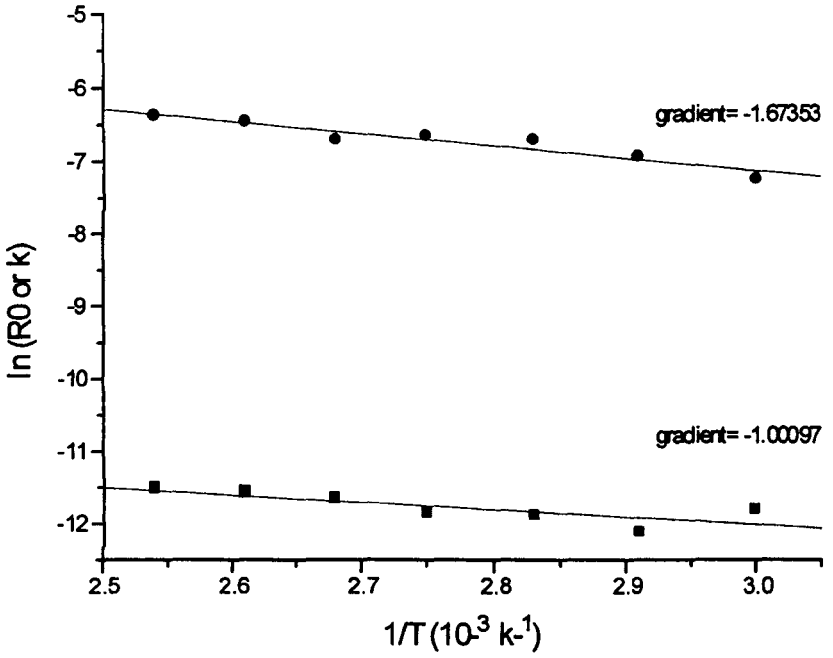


Figure A. 1.20: Arrhenious plot for reaction of hexanoic anhydride with Corsican pine sapwood (circles initial rate data, R^2=0.95; squares rate constant data R^2=0.79).

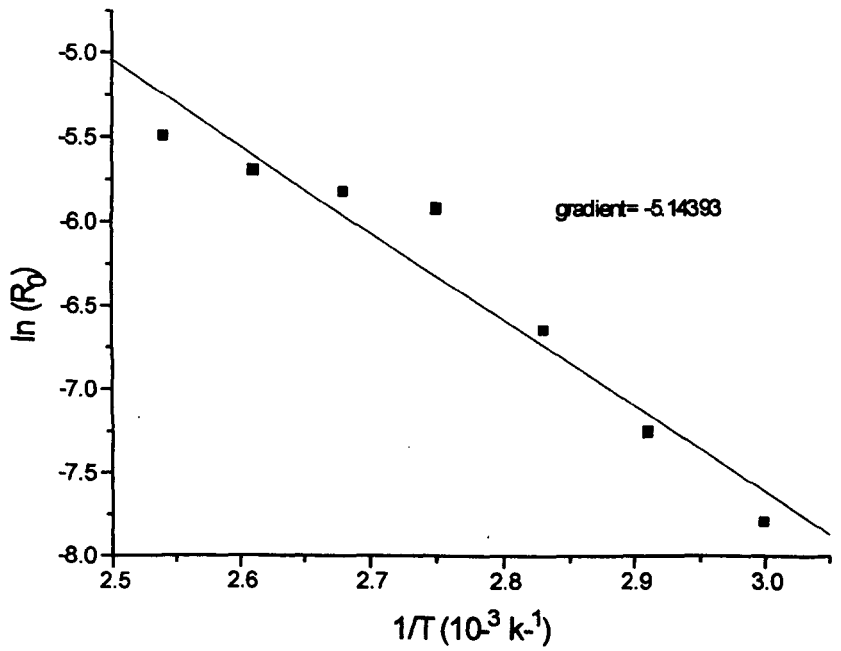


Figure A. 1.21: Arrhenius plot for reaction of acetic anhydride with Scots pine sapwood (R^2=0.96).

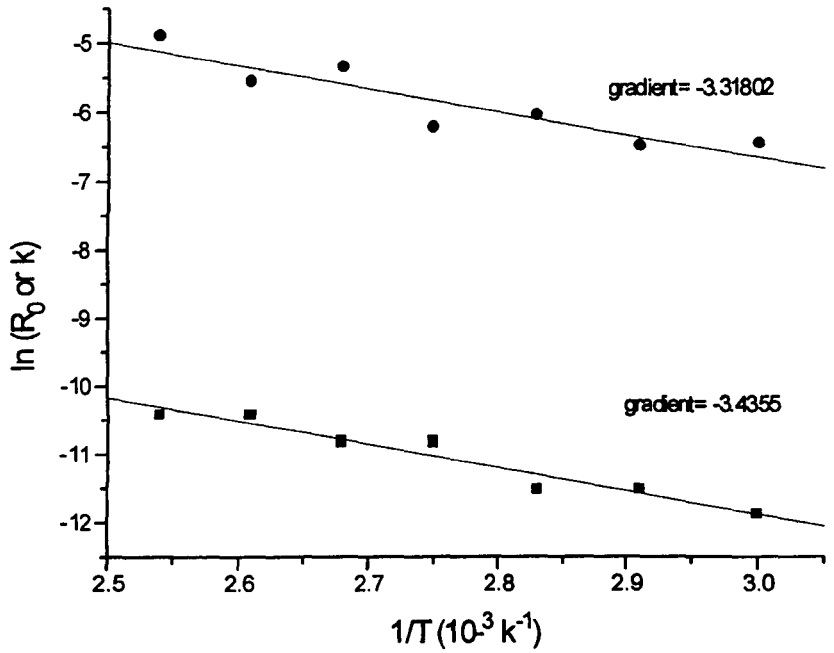


Figure A. 1.22: Arrhenius plot for reaction of propionic anhydride with Scots pine sapwood (circles initial rate data, R^2=0.91; squares rate constant data R^2=0.96).

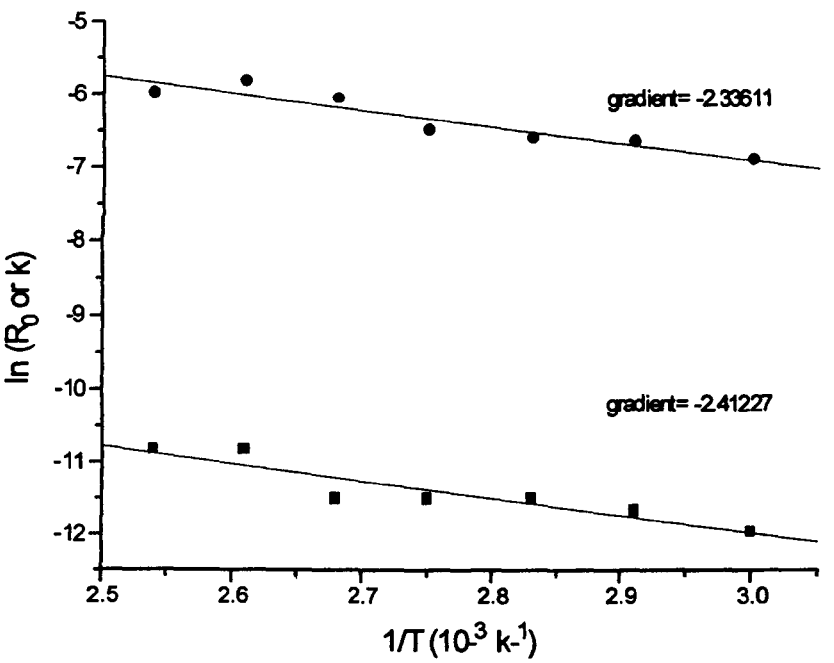


Figure A. 1.23: Arrhenius plot for reaction of butyric anhydride with Scots pine sapwood (circles initial rate data, R^2=0.91; squares rate constant data R^2=0.95).

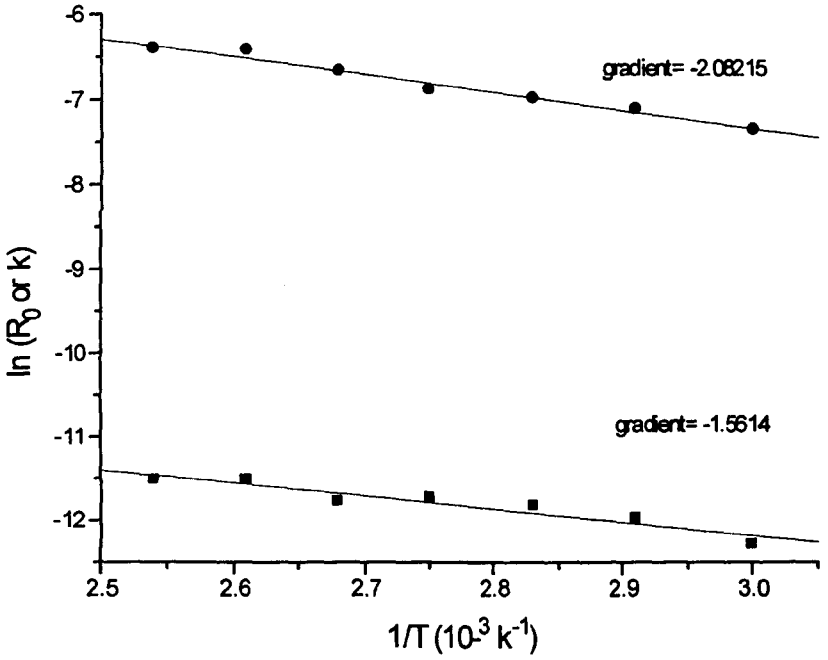


Figure A. 1.24: *Arrhenius plot for reaction of valeric anhydride with Scots pine sapwood (circles initial rate data, R^2=0.98; squares rate constant data R^2=0.99).*

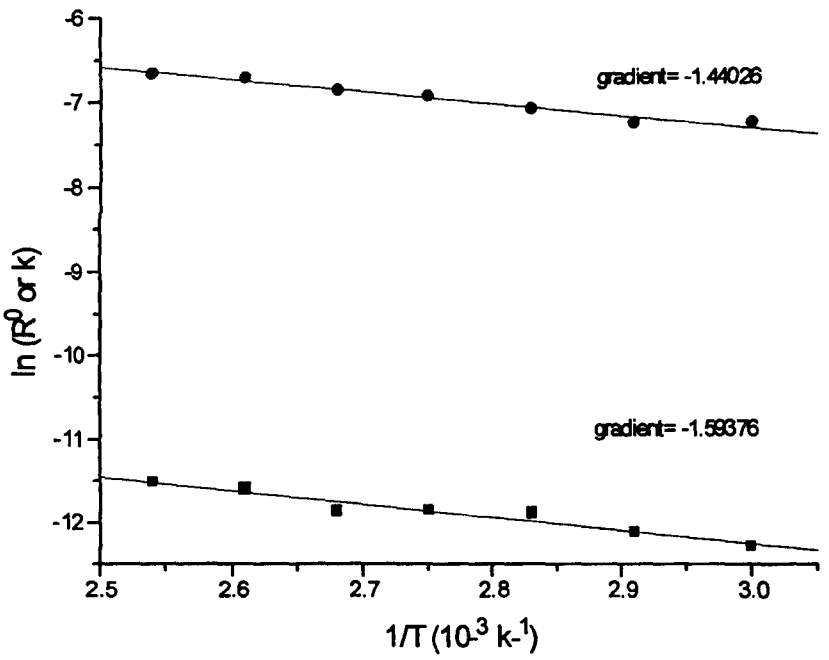


Figure A.1.25: *Arrhenius plot for reaction of hexanoic anhydride with Scots pine sapwood (circles initial rate data, R^2=0.97; squares rate constant data R^2=0.97).*

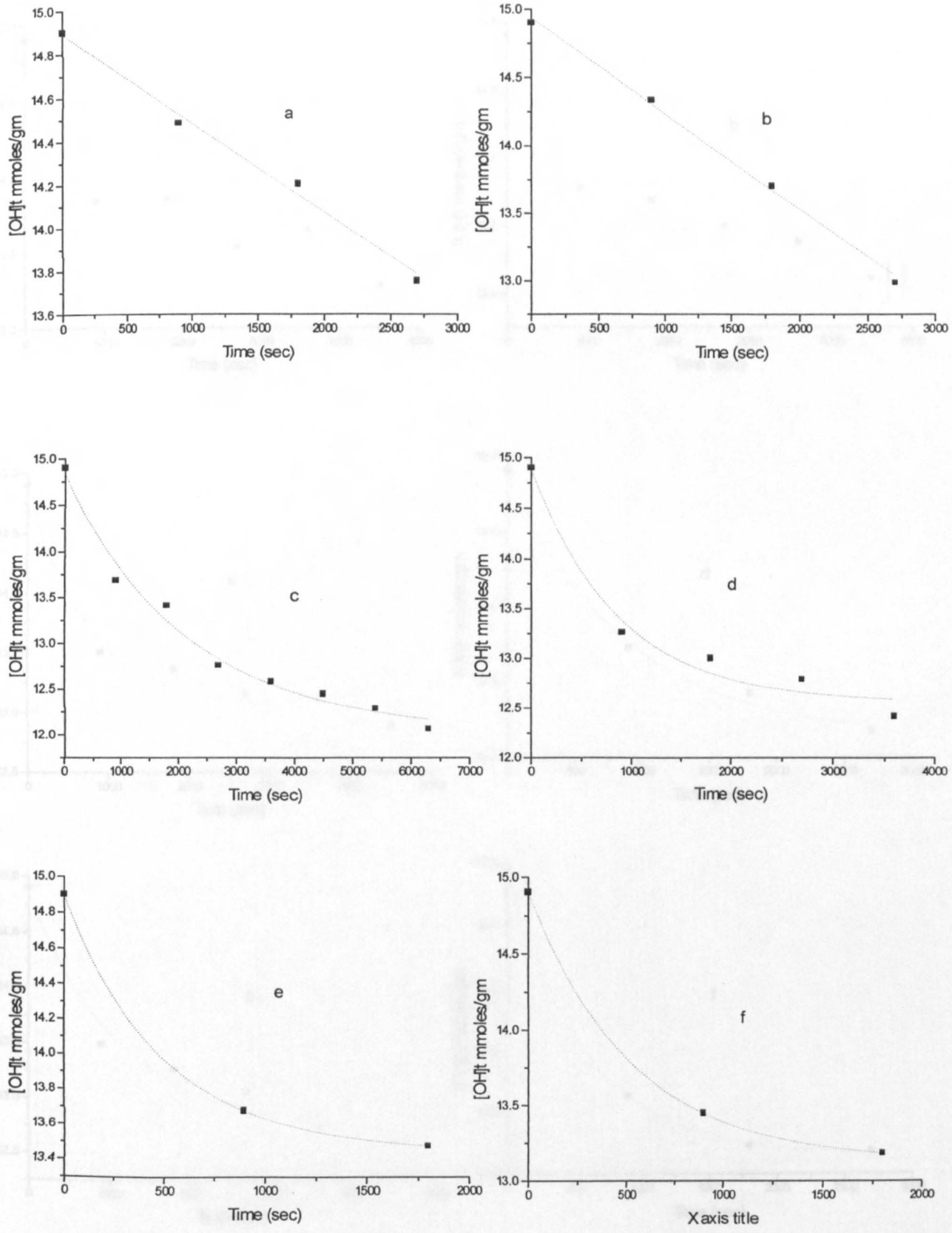


Figure A.1.26: *Exponential curve fit to kinetic data for reaction of Scots pine sapwood with acetic anhydride at at 60°C (a), 70°C (b), 80°C (c), 90°C (d), 100°C (e), 110°C (f).*

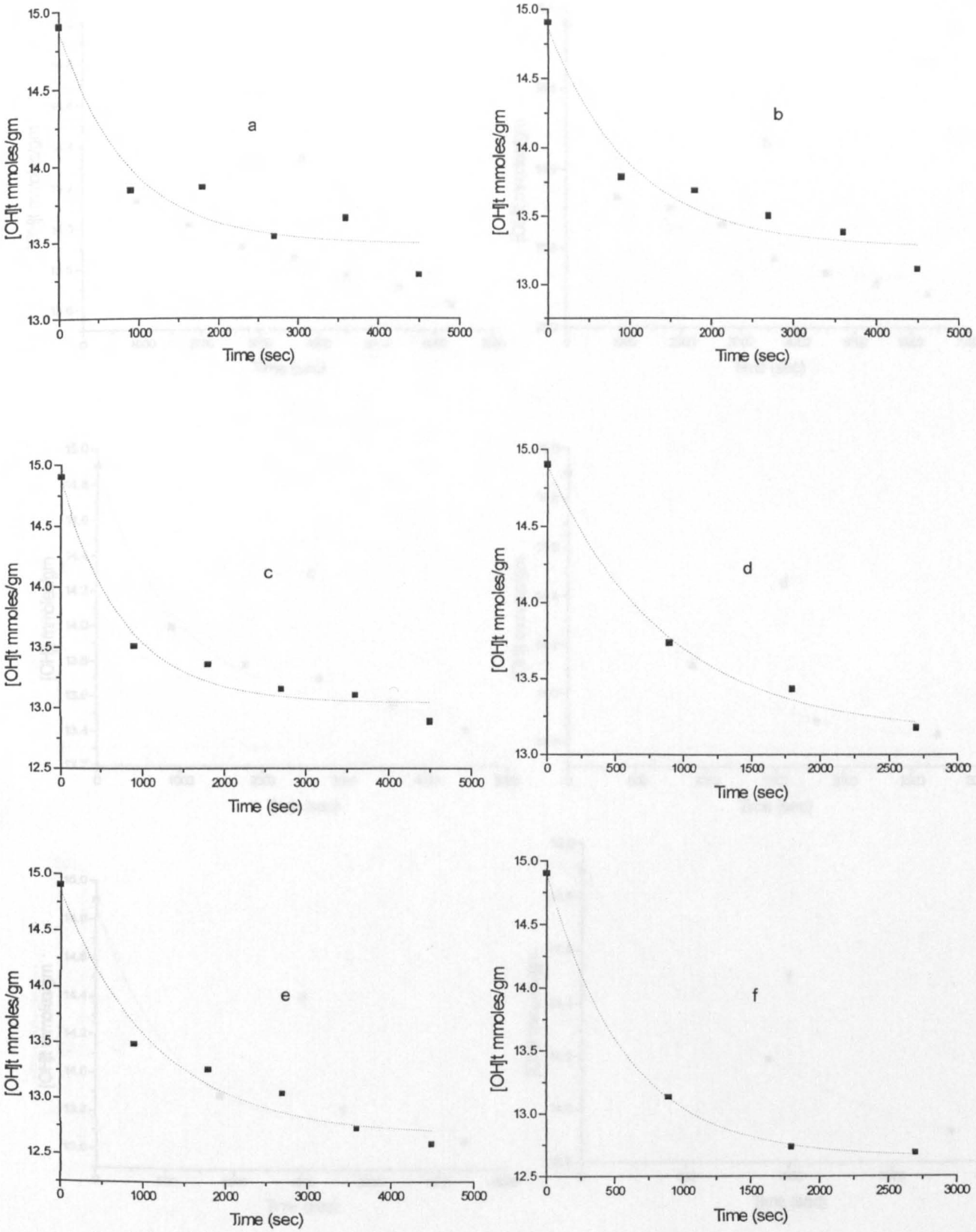


Figure A.1.27: *Exponential curve fit to kinetic data for reaction of Scots pine sapwood with propionic anhydride at at 60°C (a), 70°C (b), 80°C (c), 90°C (d), 100°C (e), 110°C (f).*

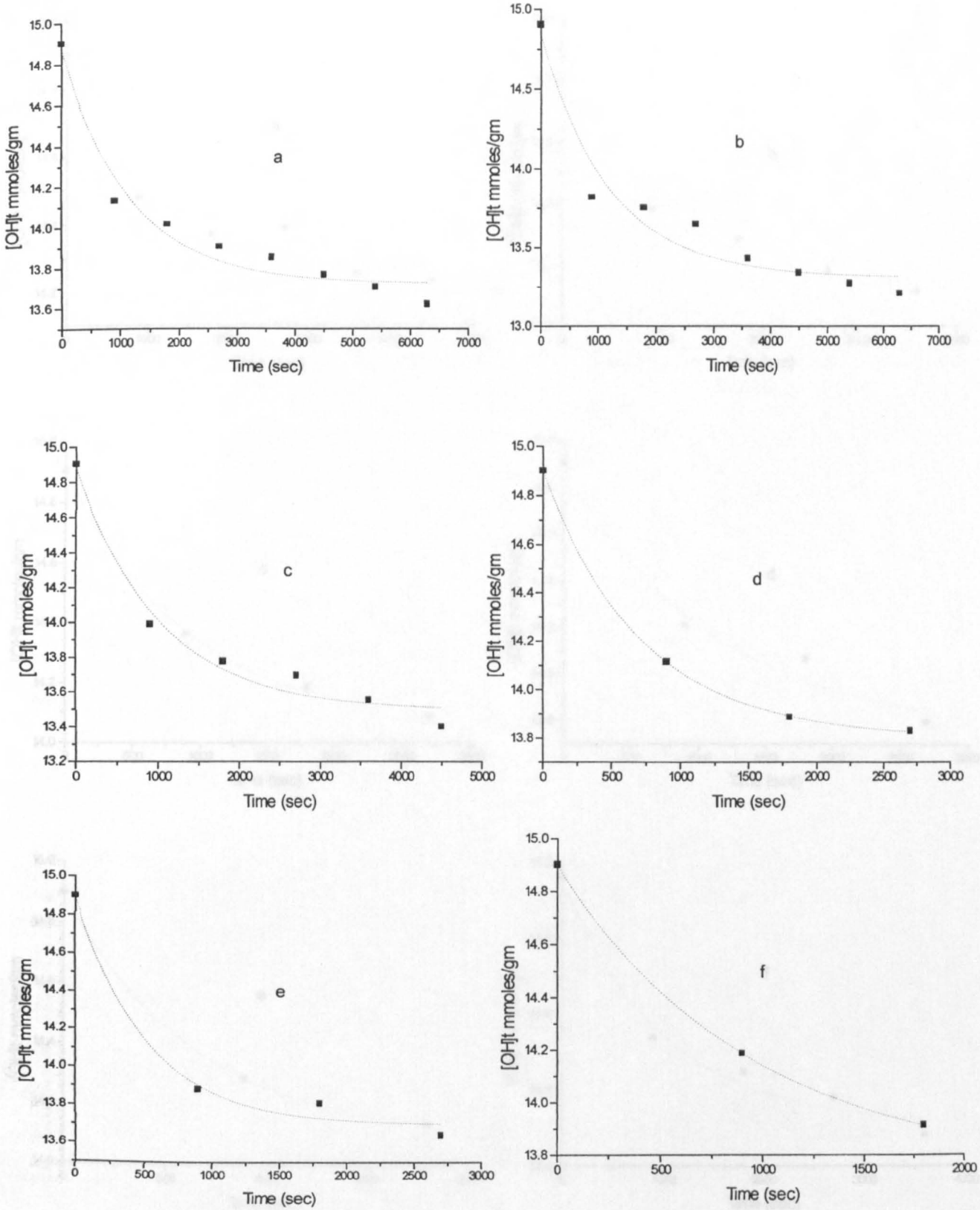


Figure A.1.28: *Exponential curve fit to kinetic data for reaction of Scots pine sapwood with butyric anhydride at at 60°C (a), 70°C (b), 80°C (c), 90°C (d), 100°C (e), 110°C (f).*

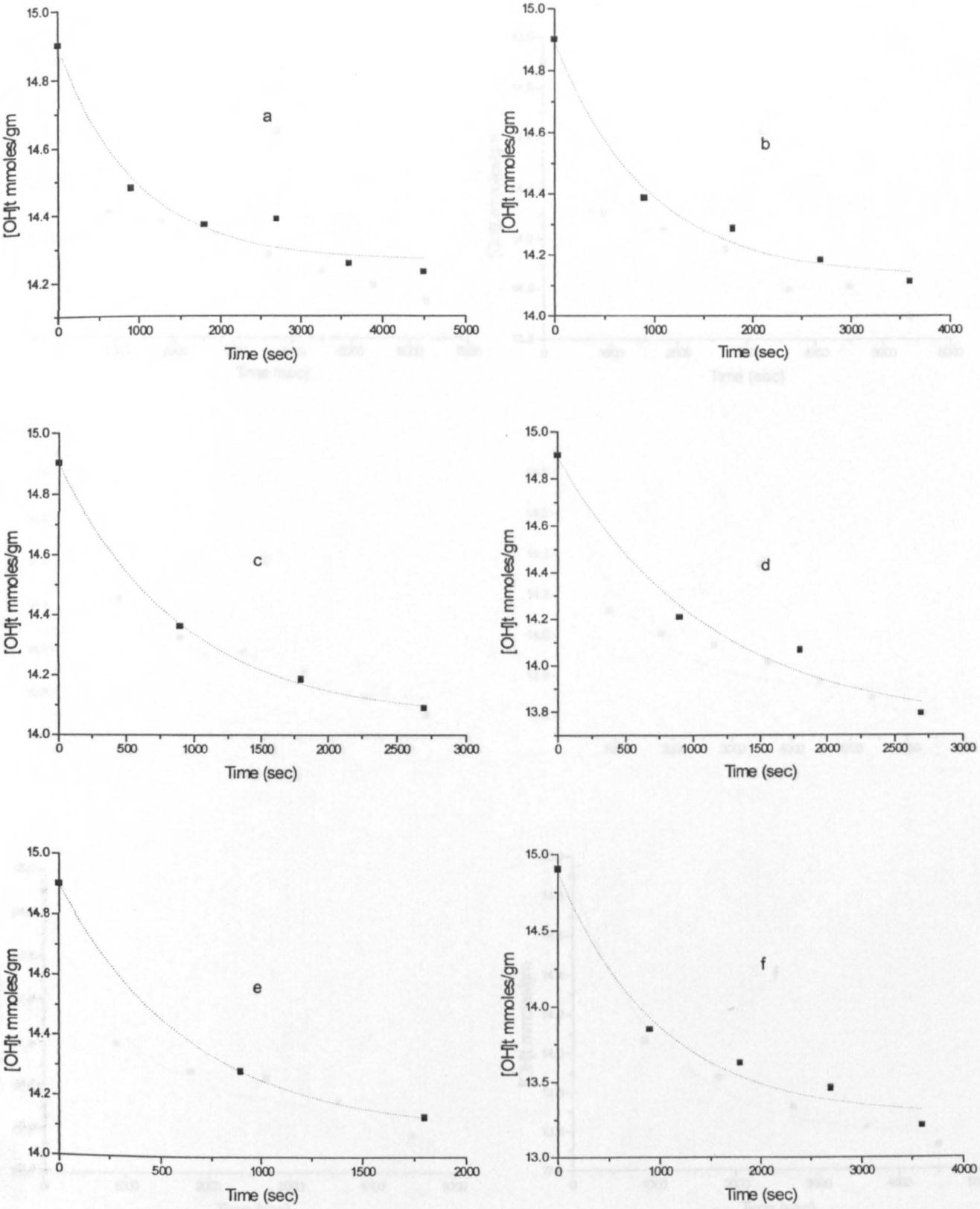


Figure A.1.29: *Exponential curve fit to kinetic data for reaction of Scots pine sapwood with valeric anhydride at at 60°C (a), 70°C (b), 80°C (c), 90°C (d), 100°C (e), 110°C (f).*

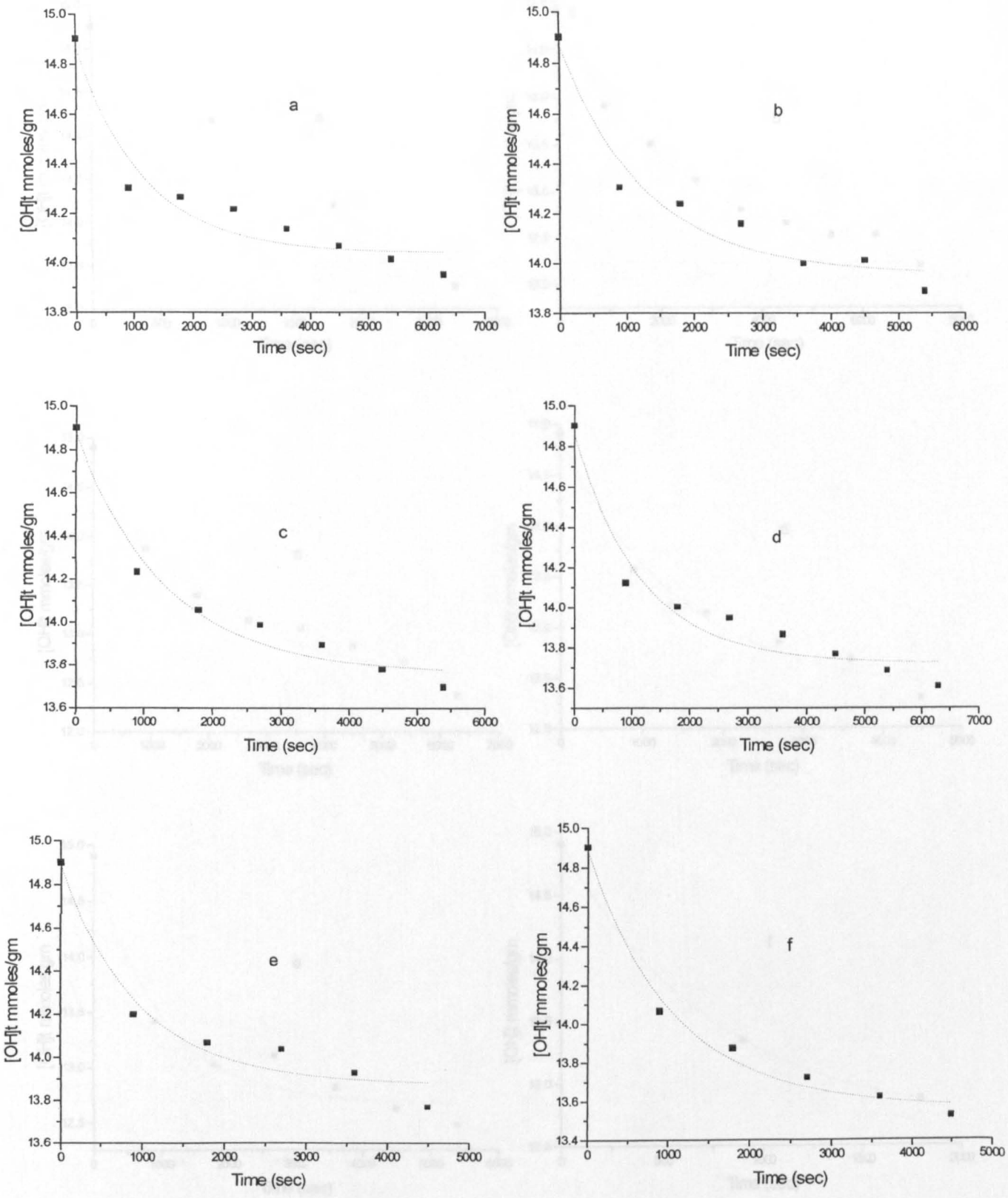


Figure A.1.30: *Exponential curve fit to kinetic data for reaction of Scots pine sapwood with hexanoic anhydride at at 60°C (a), 70°C (b), 80°C (c), 90°C (d), 100°C (e), 110°C (f).*

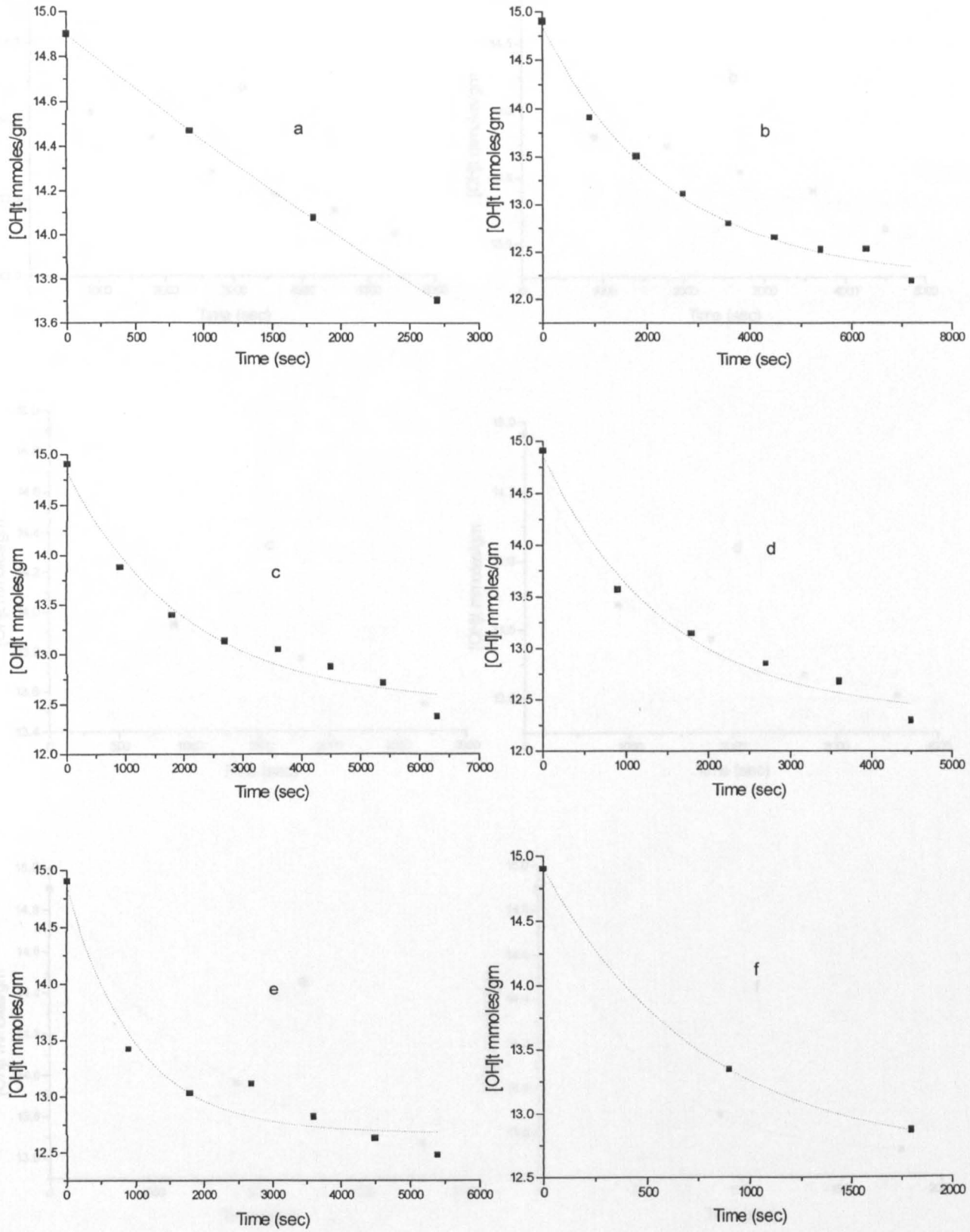


Figure A.1.31: *Exponential curve fit to kinetic data for reaction of Corsican pine sapwood with acetic anhydride at at 60°C (a), 70°C (b), 80°C (c), 90°C (d), 100°C (e), 110°C (f).*

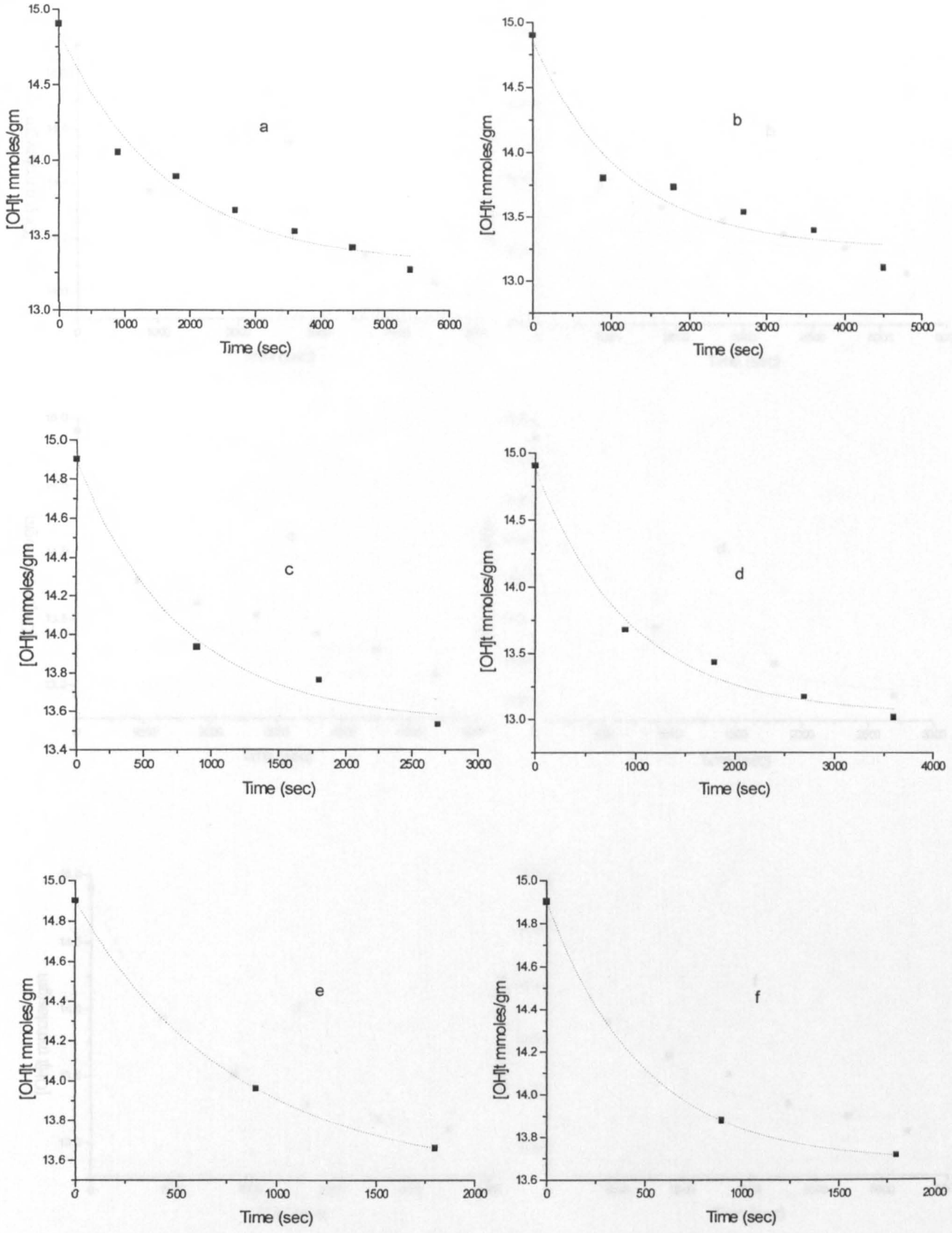


Figure A.1.32: *Exponential curve fit to kinetic data for reaction of Corsican pine sapwood with propionic anhydride at at 60°C (a), 70°C (b), 80°C (c), 90°C (d), 100°C (e), 110°C (f).*

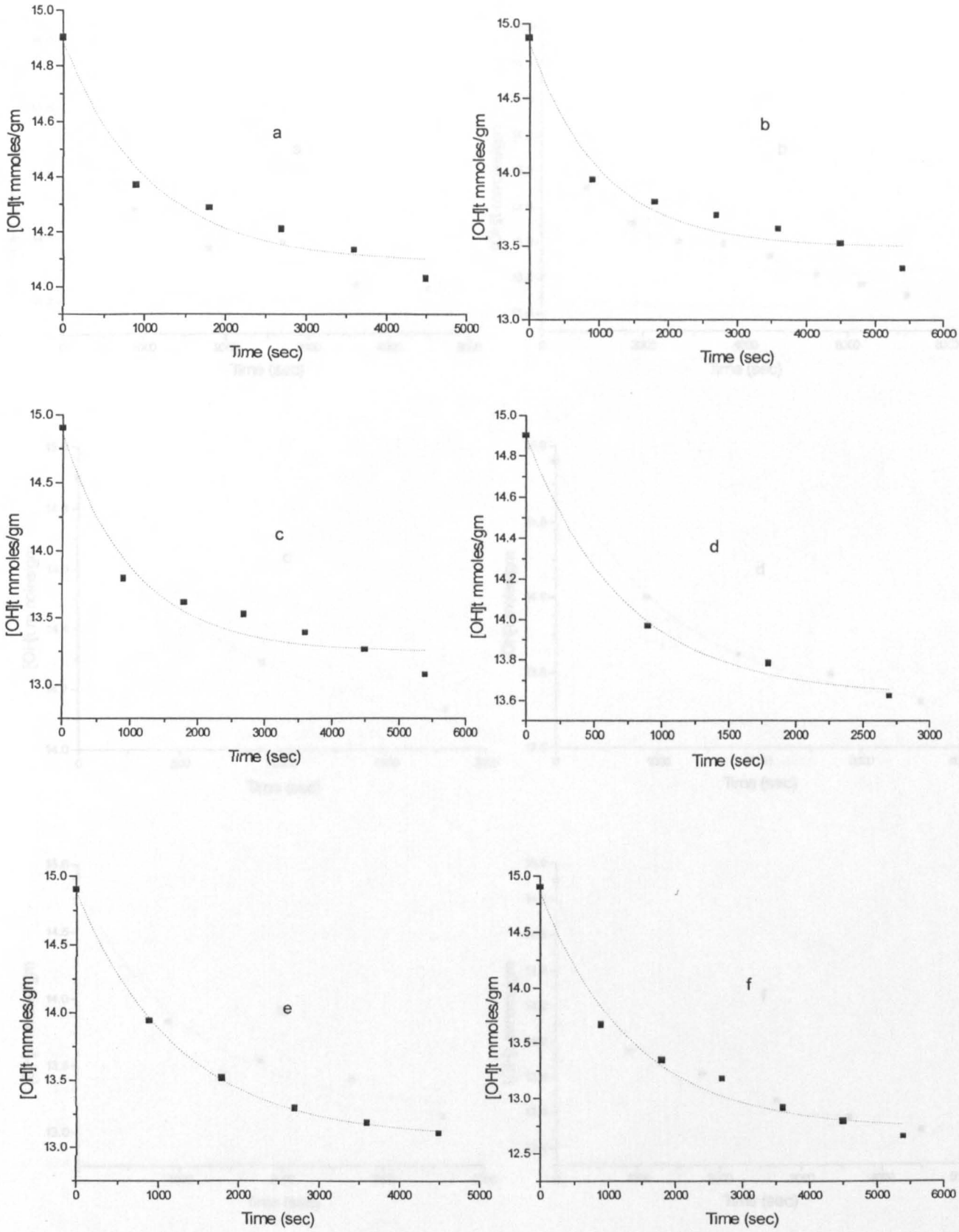


Figure A.1.33: *Exponential curve fit to kinetic data for reaction of Corsican pine sapwood with butyric anhydride at at 60°C (a), 70°C (b), 80°C (c), 90°C (d), 100°C (e), 110°C (f).*

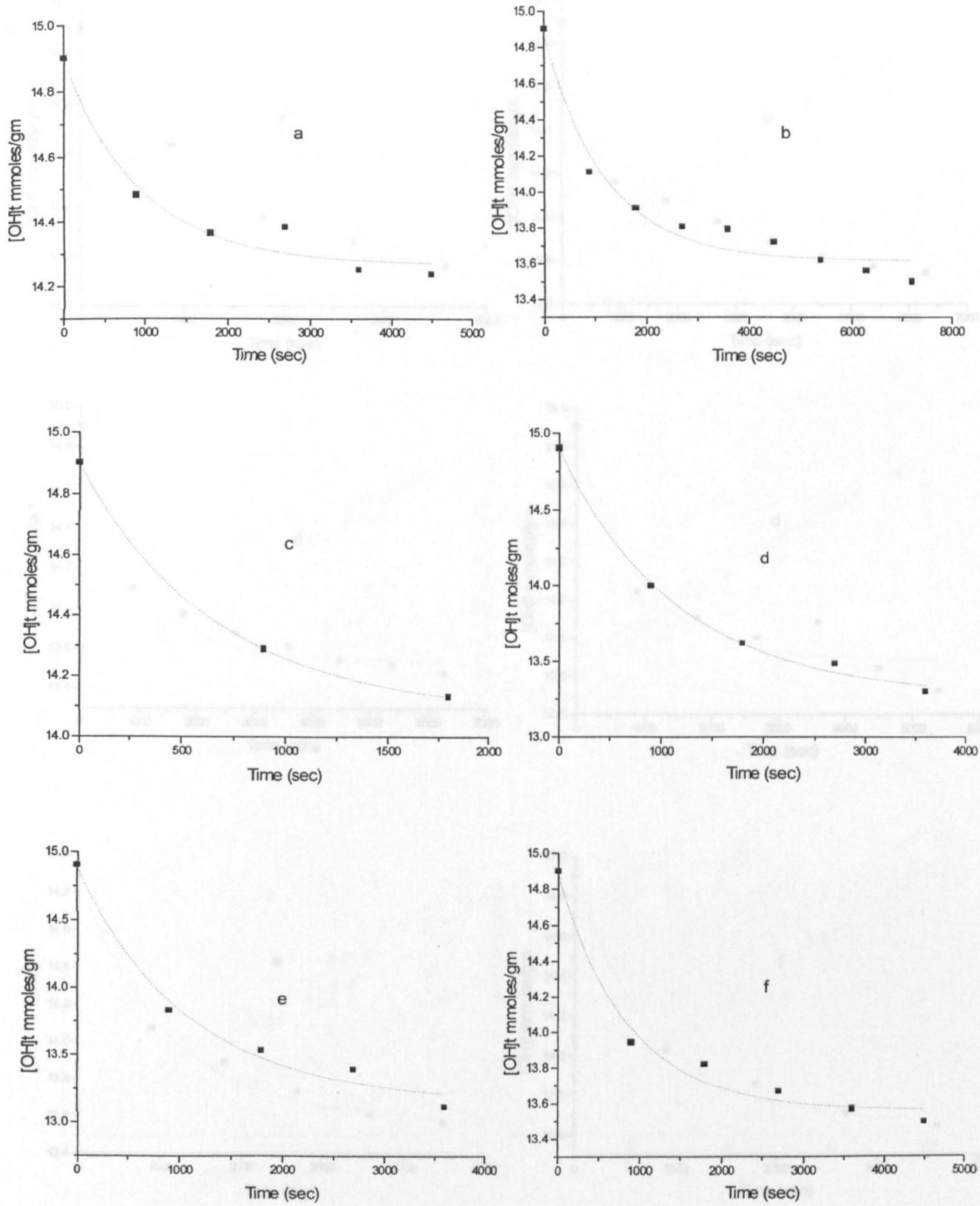


Figure A.1.34: *Exponential curve fit to kinetic data for reaction of Corsican pine sapwood with valeric anhydride at at 60°C (a), 70°C (b), 80°C (c), 90°C (d), 100°C (e), 110°C (f).*

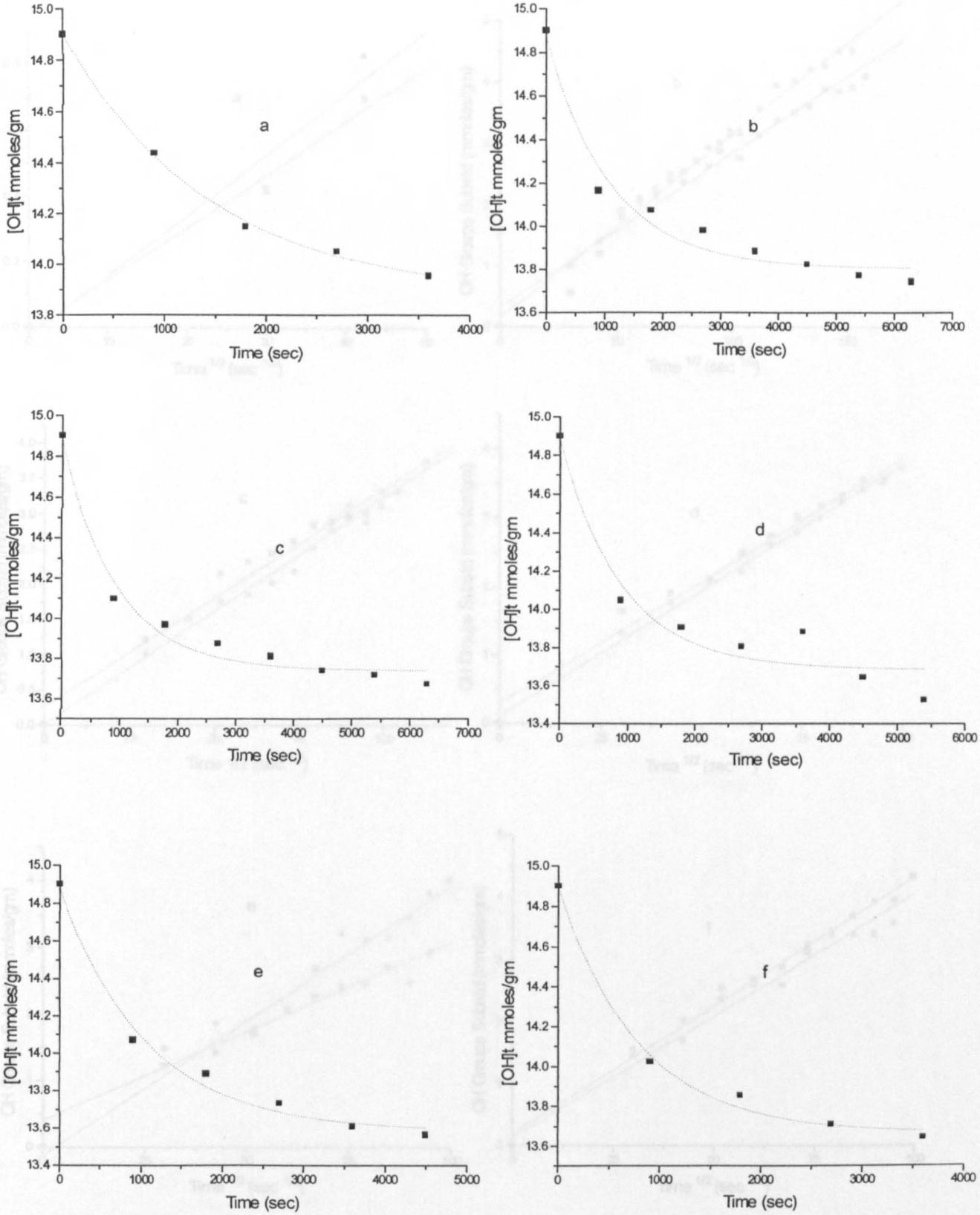


Figure A.1.35: *Exponential curve fit to kinetic data for reaction of Corsican pine sapwood with hexanoic anhydride at at 60°C (a), 70°C (b), 80°C (c), 90°C (d), 100°C (e), 110°C (f).*

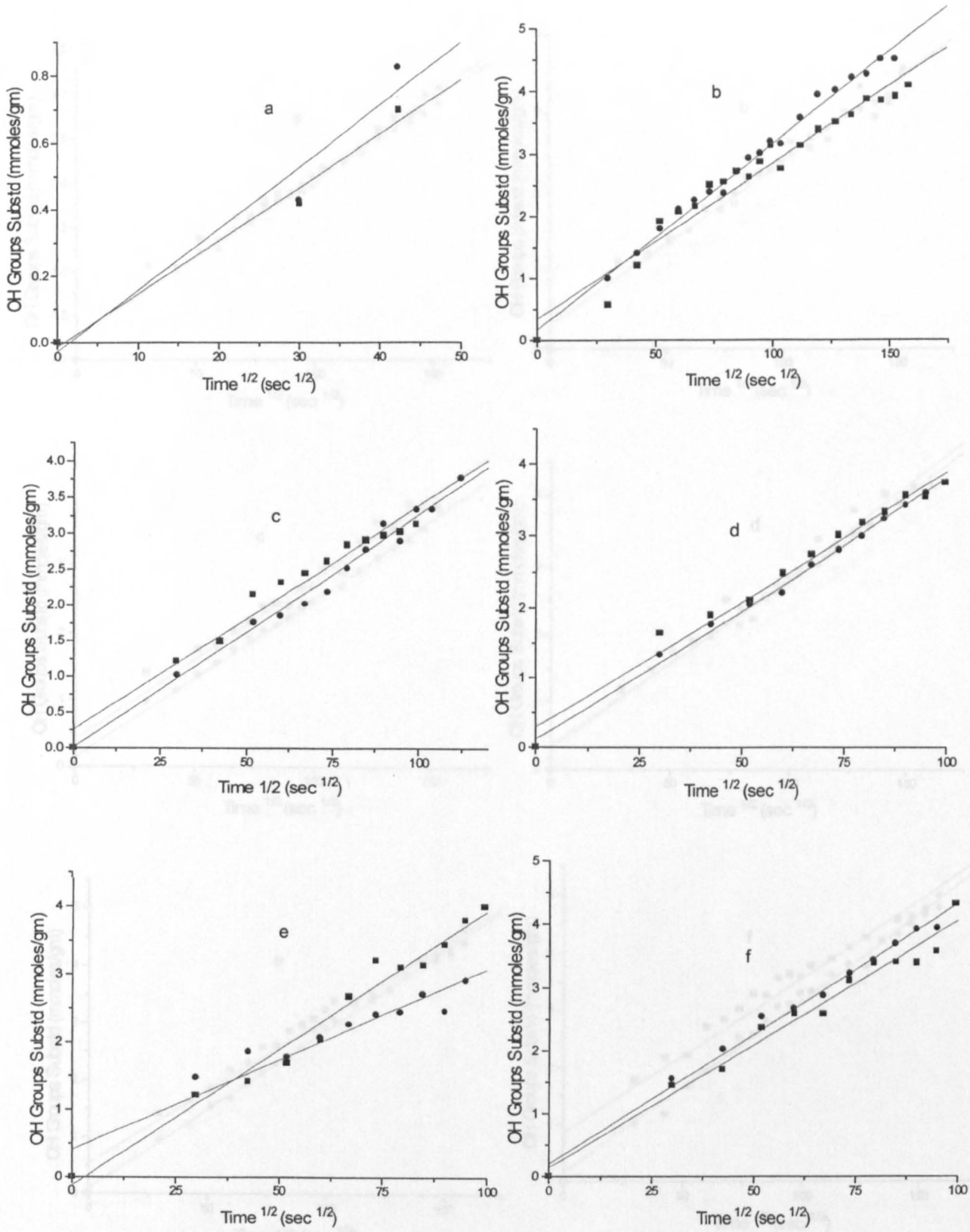


Figure A.1.36: *Diffusion profile for reaction of of Scots (squares) and Corsican pine (circles) sapwood with acetic anhydride 60°C (R^2=0.99), (R^2=0.97) (a), 70°C (R^2=0.99) (R^2=0.97) (b), 80°C (R^2=0.98) (R^2=0.99) (c), 90°C (R^2=0.99) (R^2=0.99) (d), 100°C (R^2=0.98) (R^2=0.96) (e), 110°C (R^2=0.98) (R^2=0.99) (f).*

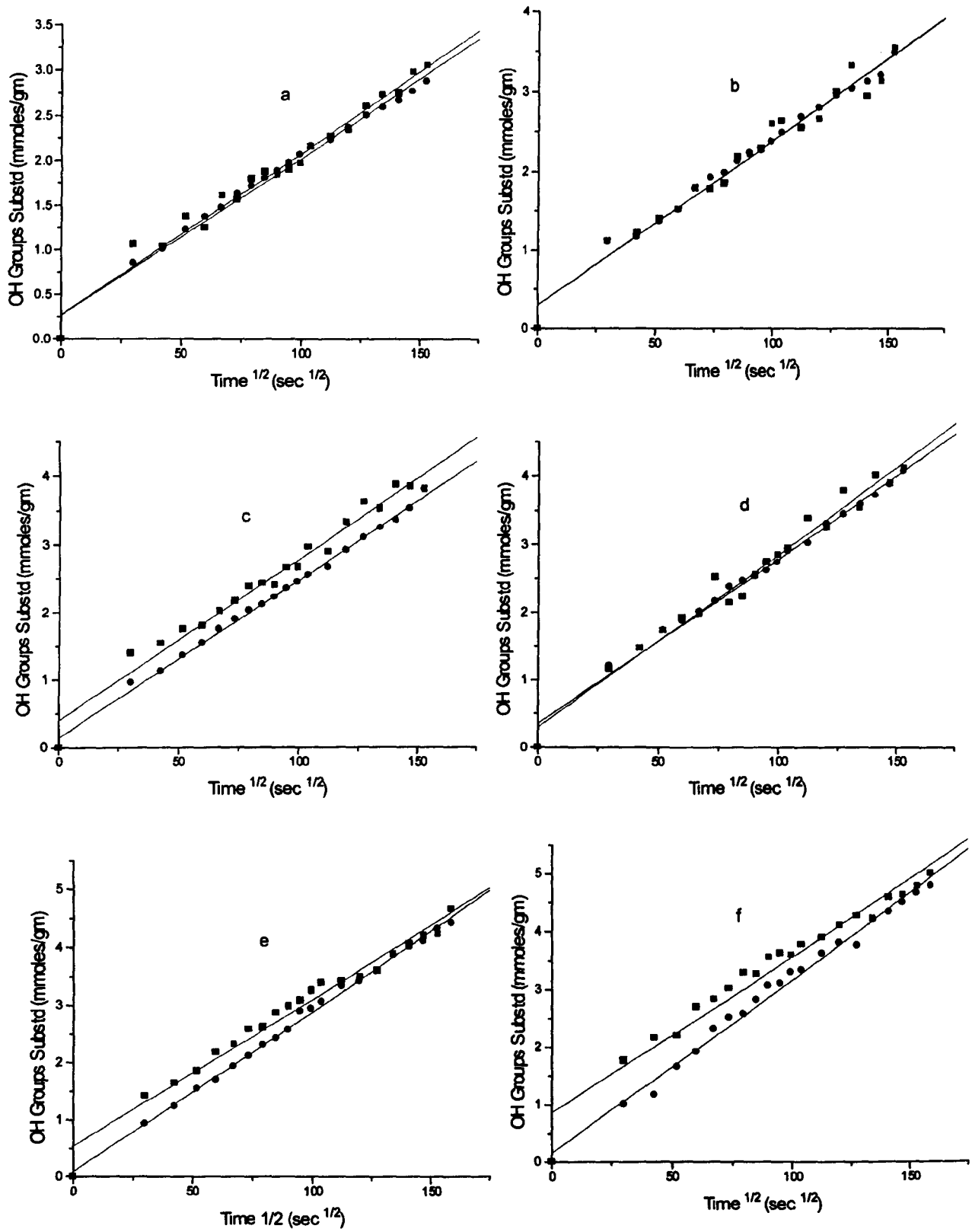


Figure A.1.37: Diffusion profile for reaction of of Scots (squares) and Corsican pine (circles) sapwood with propionic anhydride 60°C (R^2=0.98), (R^2=0.99) (a), 70°C (R^2=0.98) (R^2=0.99) (b), 80°C (R^2=0.98) (R^2=0.99) (c), 90°C (R^2=0.98) (R^2=0.99) (d), 100°C (R^2=0.98) (R^2=0.99) (e), 110°C (R^2=0.97) (R^2=0.99) (f).

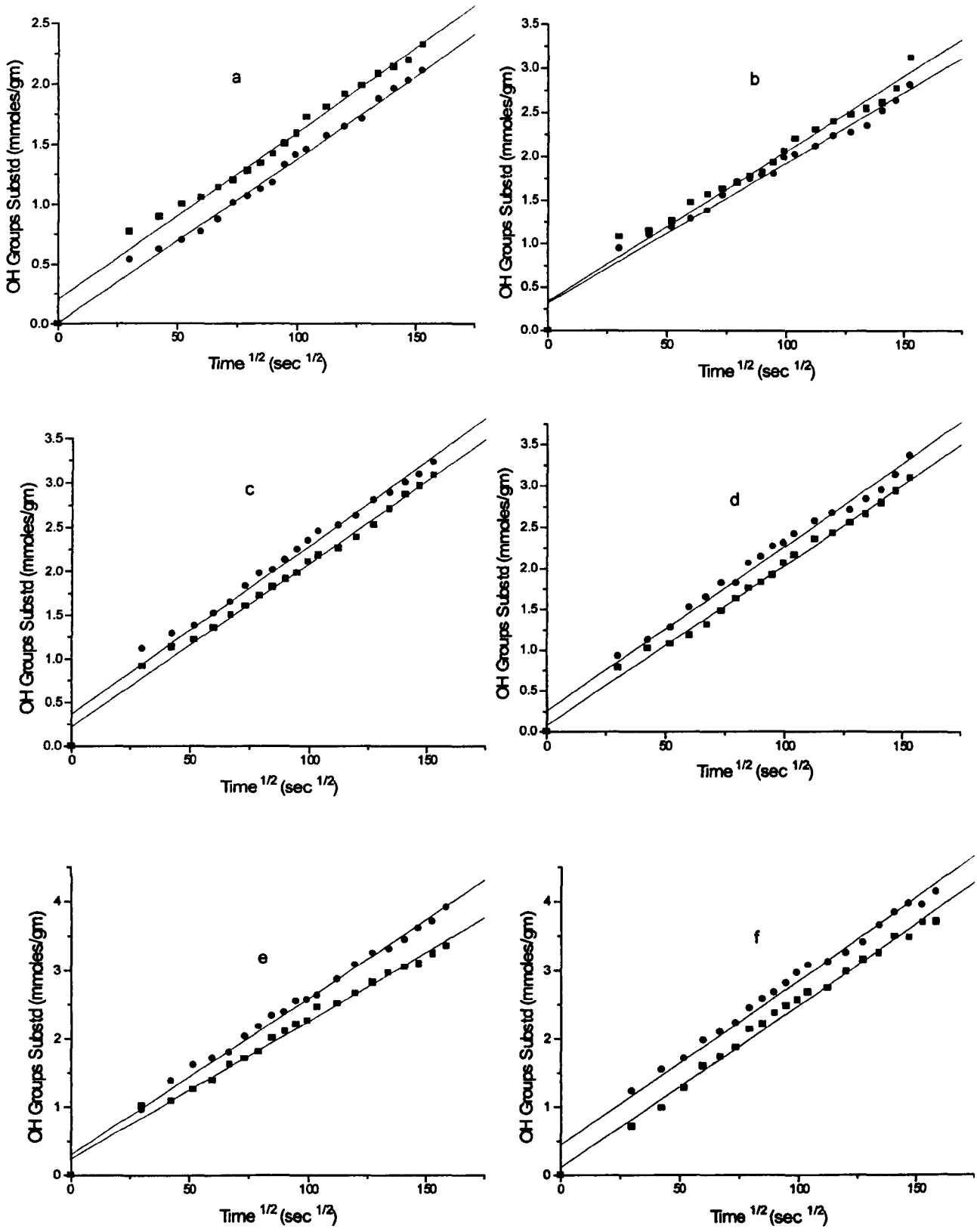


Figure A.1.38: *Diffusion profile for reaction of of Scots (squares) and Corsican pine (circles) sapwood with butyric anhydride 60°C (R^2=0.99), (R^2=0.99) (a), 70°C (R^2=0.98) (R^2=0.98) (b), 80°C (R^2=0.99) (R^2=0.99) (c), 90°C (R^2=0.99) (R^2=0.99) (d), 100°C (R^2=0.99) (R^2=0.99) (e), 110°C (R^2=0.99) (R^2=0.99) (f).*

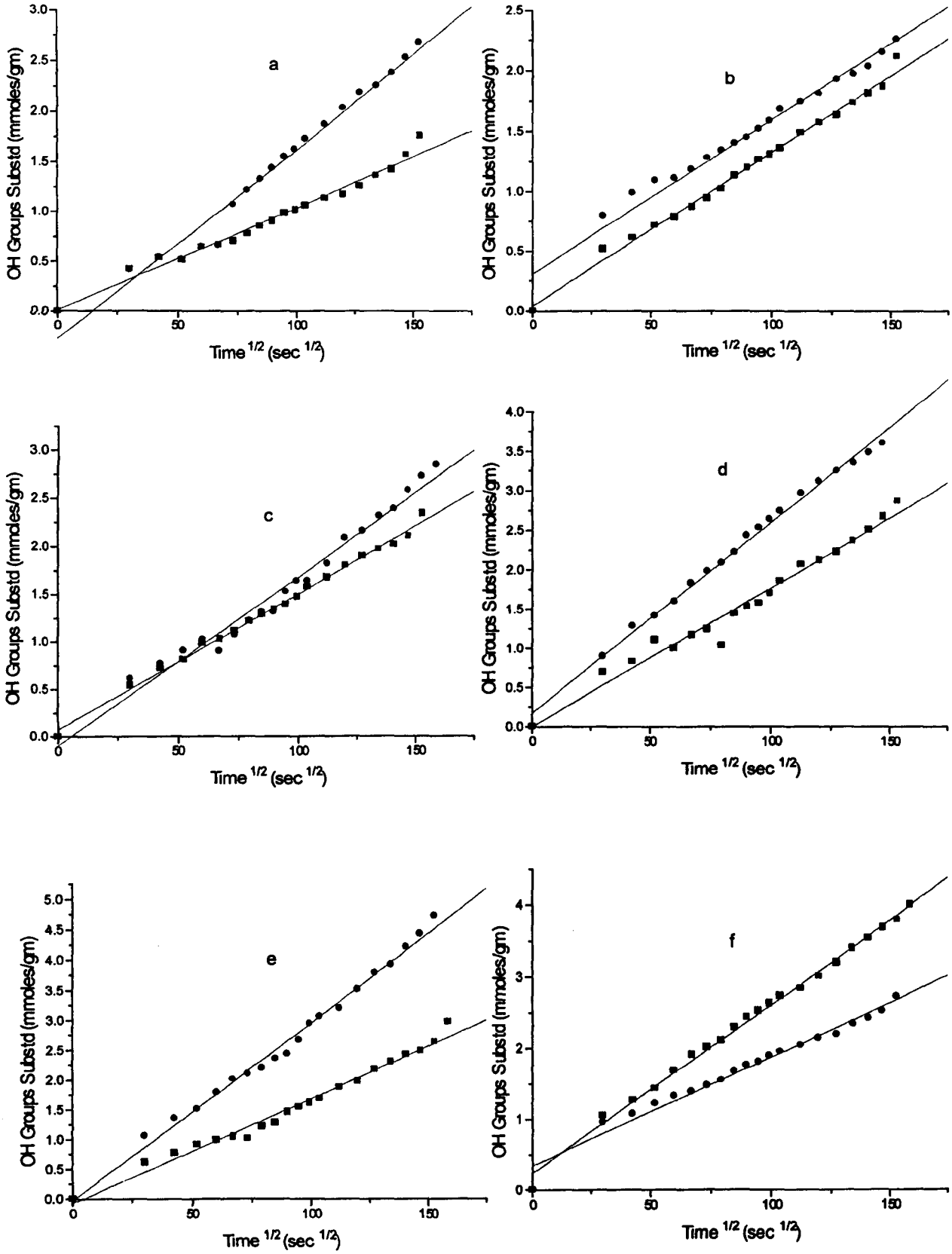


Figure A.1.39: *Diffusion profile for reaction of of Scots (squares) and Corsican pine (circles) sapwood with valeric anhydride 60°C (R^2=0.98), (R^2=0.98) (a), 70°C (R^2=0.98) (R^2=0.98) (b), 80°C (R^2=0.99) (R^2=0.98) (c), 90°C (R^2=0.98) (R^2=0.99) (d), 100°C (R^2=0.99) (R^2=0.99) (e), 110°C (R^2=0.99) (R^2=0.99) (f).*

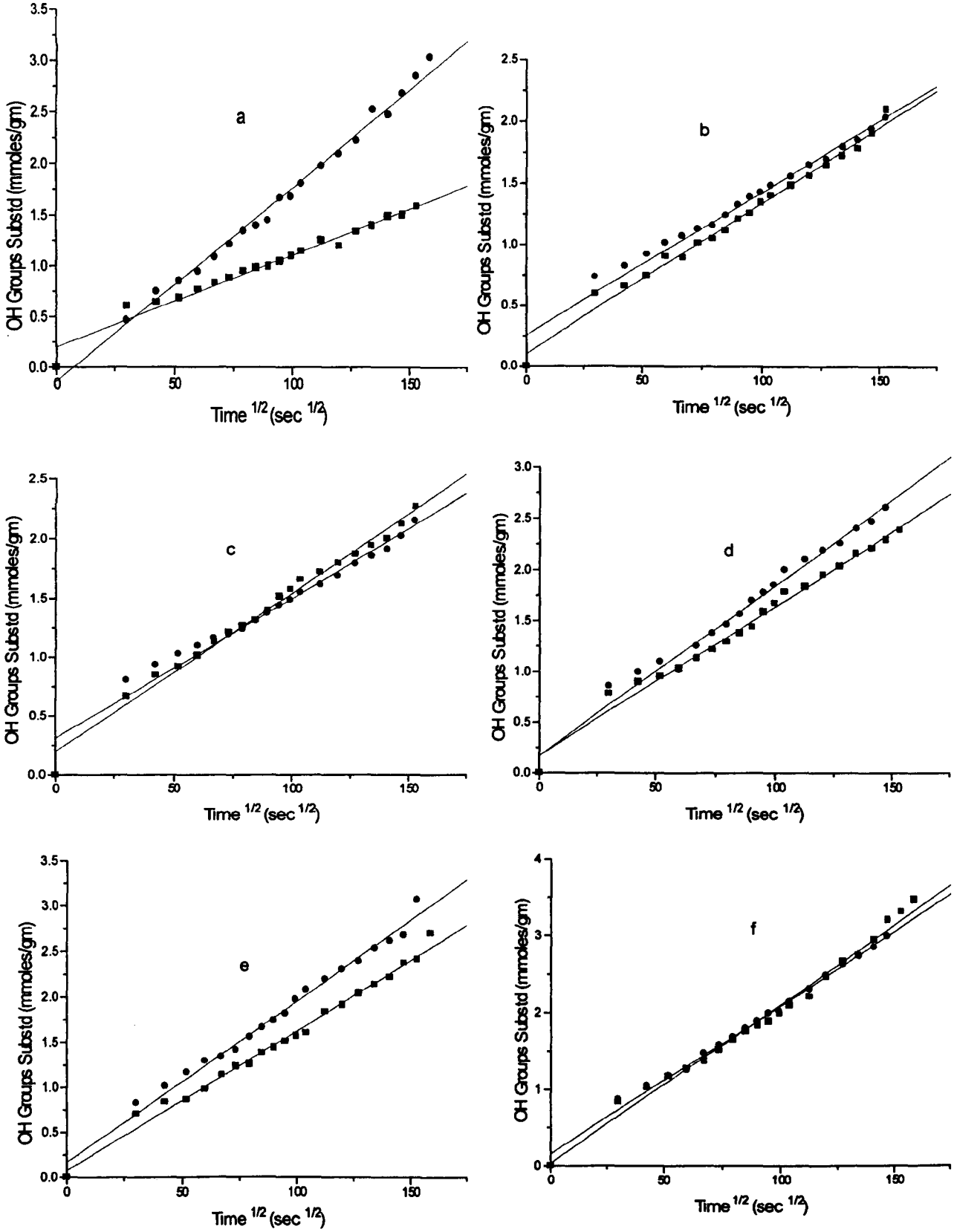


Figure A.1.40: *Diffusion profile for reaction of of Scots (squares) and Corsican pine (circles) sapwood with hexanoic anhydride 60°C (R^2=0.99), (R^2=0.98) (a), 70°C (R^2=0.98) (R^2=0.98) (b), 80°C (R^2=0.99) (R^2=0.98) (c), 90°C (R^2=0.99) (R^2=0.98) (d), 100°C (R^2=0.99) (R^2=0.99) (e), 110°C (R^2=0.99) (R^2=0.99) (f).*

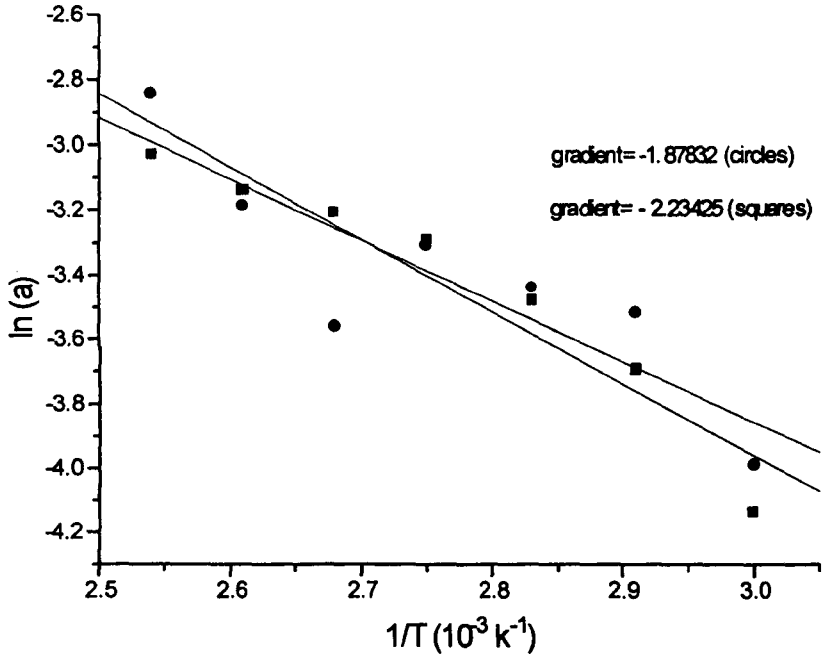


Figure A. 1.41: *Arrhenius plot derived from the diffusion data for reaction of acetic anhydride with Scots pine (squares, R^2=0.98) and Corsican pine sapwwod (circles R^2=0.98).*

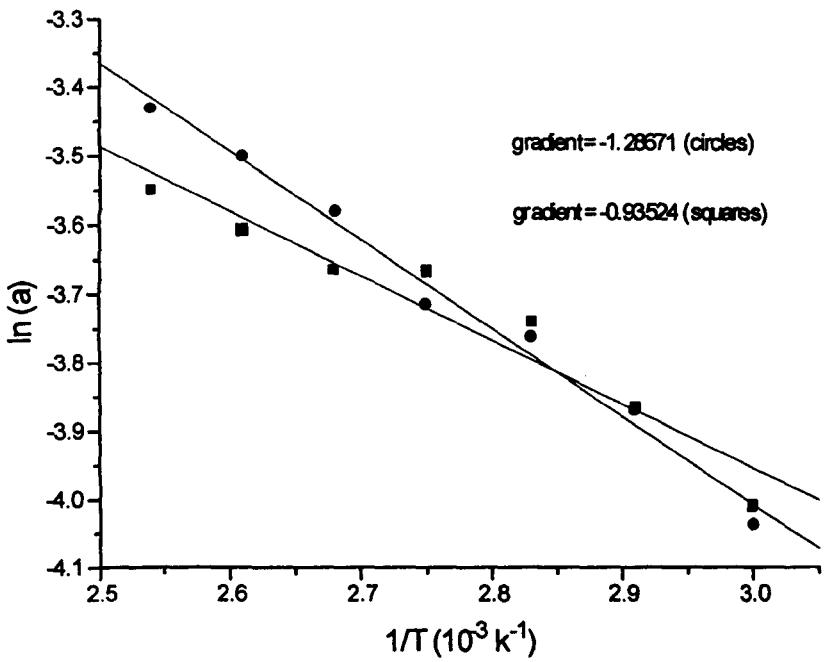


Figure A. 1.42: *Arrhenius plot derived from the diffusion data for reaction of propionic anhydride with Scots pine (squares, R^2=0.96) and Corsican pine sapwwod (circles R^2=0.99).*

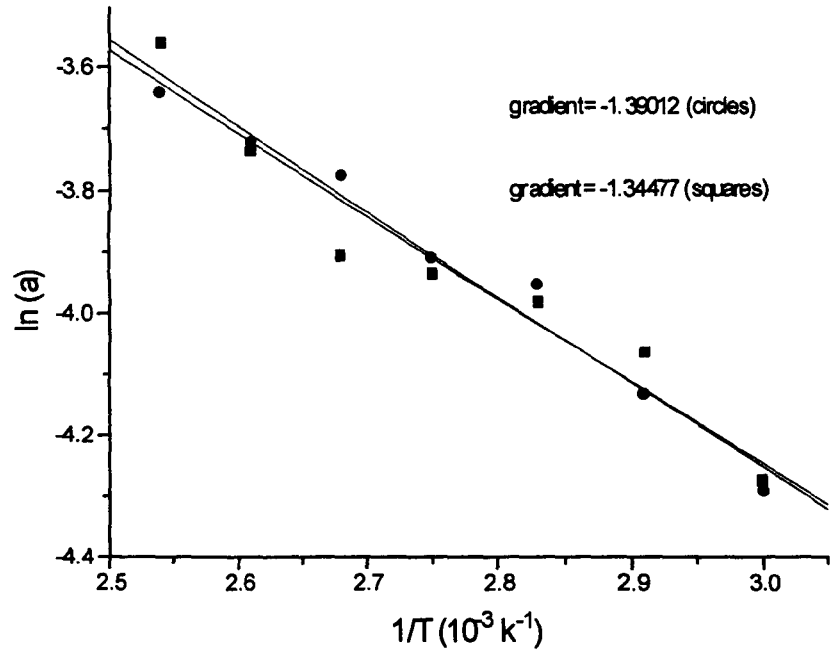


Figure A. 1.43: Arrhenius plot derived from the diffusion data for reaction of butyric anhydride with Scots pine (squares, R^2=0.96) and Corsican pine sapwwod (circles R^2=0.98).

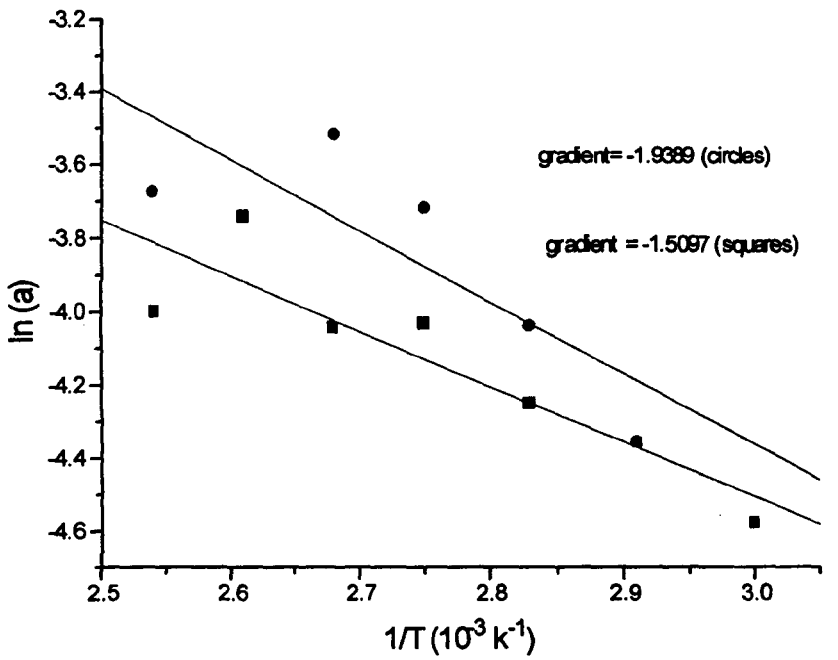


Figure A. 1.44: Arrhenius plot derived from the diffusion data for reaction of valeric anhydride with Scots pine (squares, R^2=0.90) and Corsican pine sapwwod (circles R^2=0.82).

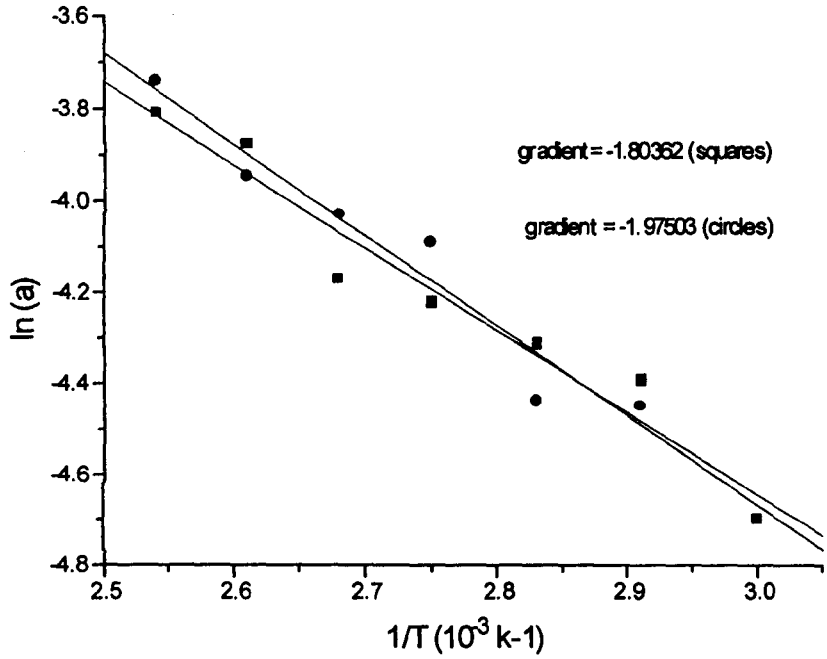


Figure A. 1.45: *Arrhenius plot derived from the diffusion data for reaction of hexanoic anhydride with Scots pine (squares, R^2=0.97) and Corsican pine sapwwod (circles R^2=0.97).*

Table 72: *Arrehnius data (from rate constants) of Corsican pine modified with a homologous series of linear chain anhydrides.*

Temperature (°C)	Acetic	Propionic	Butyric ln (k)	Valeric	Hexanoic
120	-	-10.4143	-10.8197	-10.81978	-11.5129
110	-	-10.8197	-10.8197	-11.5854	-11.5642
100	-	-11.5129	-10.8197	-10.8197	-11.652
90	-	-11.5433	-11.5129	-11.512925	-11.84143
80	-	-11.5748	-11.5129	-11.512925	-11.8839
70	-	-11.7236	-11.5229	-12.0405	-12.1107
60	-	-11.9437	-11.84143	-11.77429	-11.800508

Table 73: *Arrehnius data (from rate constants) of Scots pine modified with a homologous series of linear chain anhydrides.*

Temperature (°C)	Acetic	Propionic	Butyric ln (k)	Valeric	Hexanoic
120	-	-10.414313	-10.819718	-11.512925	-11.512925
110	-	-10.414313	-10.819718	-11.512925	-11.596307
100	-	-10.819778	-11.512925	-11.77429	-11.8554
90	-	-10.819778	-11.512925	-11.736069	-11.84143
80	-	-11.512925	-11.512925	-11.8276	-11.883989
70	-	-11.512925	-11.67544	-11.97496	-12.110762
60	-	-11.883989	-11.974961	-12.2894	-12.289454

Table 74: *Arrehnius data (from initial rates) of Corsican pine modified with a homologous series of linear chain anhydrides.*

Temperature (°C)	Acetic	Propionic	Butyric ln (R_0)	Valeric	Hexanoic
120	-5.3319	-5.4868	-5.6818	-6.2331	-6.38744
110	-5.8366	-6.0014	-6.4732	-6.4665	-6.4672
100	-6.11026	-6.3494	-6.5305	-6.4322	-6.7019
90	-6.3844	-6.2486	-6.3359	-6.5765	-6.64485
80	-6.7801	-6.3651	-6.4984	-6.6898	-6.71941
70	-6.827	-6.5821	-6.6300	-6.87812	-6.93639
60	-7.6147	-6.979	-7.2013	-7.3231	-7.24534

Table 75: *Arrehnius data (from initial rates) of Scots pine modified with a homologous series of linear chain anhydrides.*

Temperature (°C)	Acetic	Propionic	Butyric ln (R_0)	Valeric	Hexanoic
120	-5.4947	-4.9060078	-5.9919	-6.40258	-6.653181
110	-5.6965	-5.54658	-5.8251	-6.428	-6.70317
100	-5.823	-5.35582	-6.0563	-6.6704	-6.85421
90	-5.9287	-6.2146223	-6.478765	-6.8859	-6.92721
80	-6.64295	-6.02262	-6.5921	-6.9824	-7.0681
70	-7.2575	-6.485181	-6.6657	-7.1	-7.2512
60	-7.79241	-6.4433603	-6.91399	-7.3318	-7.24265

Table 76: *Arrehnius data (diffusion) of Corsican pine modified with a homologous series of linear chain anhydrides.*

Temperature (°C)	Acetic	Propionic	Butyric ln (a)	Valeric	Hexanoic
60	-3.9899	-4.0364	-4.29255		
70	-3.5122	-3.868	-4.1308	-4.3567	-4.4474
80	-3.4336	-3.76102	-3.9528	-4.0358	-4.4379
90	-3.3055	-3.7139	-3.90703	-3.7201	-4.0887
100	-3.5575	-3.5798	-3.7766	-3.5203	-4.0279
110	-3.1822	-3.50009	-3.7234		-3.9435
120	-2.8397	-3.4305	-3.6412	-3.674	-3.7384

Table 77: *Arrehnius data (diffusion) of Scots pine modified with a homologous series of linear chain anhydrides.*

Temperature (°C)	Acetic	Propionic	Butyric ln (a)	Valeric	Hexanoic
60	-4.135	-4.0096	-4.2744	-4.5795	-4.6972
70	-3.6888	-3.86657	-4.064	-4.3575	-4.3924
80	-3.4737	-3.7393	-3.9819	-4.2495	-4.311
90	-3.2886	-3.6667	-3.9352	-4.033	-4.2212
100	-3.2062	-3.6663	-3.9055	-4.044	-4.1701
110	-3.1359	-3.6082	-3.7368	-3.7414	-3.875
120	-3.0285	-3.5498	-3.5613	-3.9997	-3.809

APPENDIX 1B

A value for $[OH]_0$ of 14.9 mmoles/gm of hydroxyl groups per gram of wood was used to calculate this figure. This value is an estimate of the concentration of hydroxyl groups in the wood calculating using the composition of Scots pine as a model for Corsican pine (see Table 1.1A) (Fengel and Wegener, 1989).

***Table 1.1A**: Composition of Scots pine.*

Component	% Composition	OH Groups per unit (Rowell, 1980)	Molecular weight of units
Lignin	26	$1/C_9$	180
Cellulose	52	$3/C_6$	162
Hexosan	14	$3/C_6$	162
Pentosan	8	$2/C_5$	132

The number of moles of hydroxyl groups per gram was then calculated from the equation 1.1.A:

***Equation** 1.1.A:*

$$(0.26 \times 1) / 180 + (0.52 \times 3) / 162 + (0.14 \times 3) / 162 + (0.08 \times 2) / 132 = 0.0149$$

The number of moles of substituted OH groups is calculated by determining the weight gain per gram of wood and dividing by the molecular weight of the adduct; this value is then substracted from $[OH]_0$ to give $[OH]_t$.

APPENDIX 2

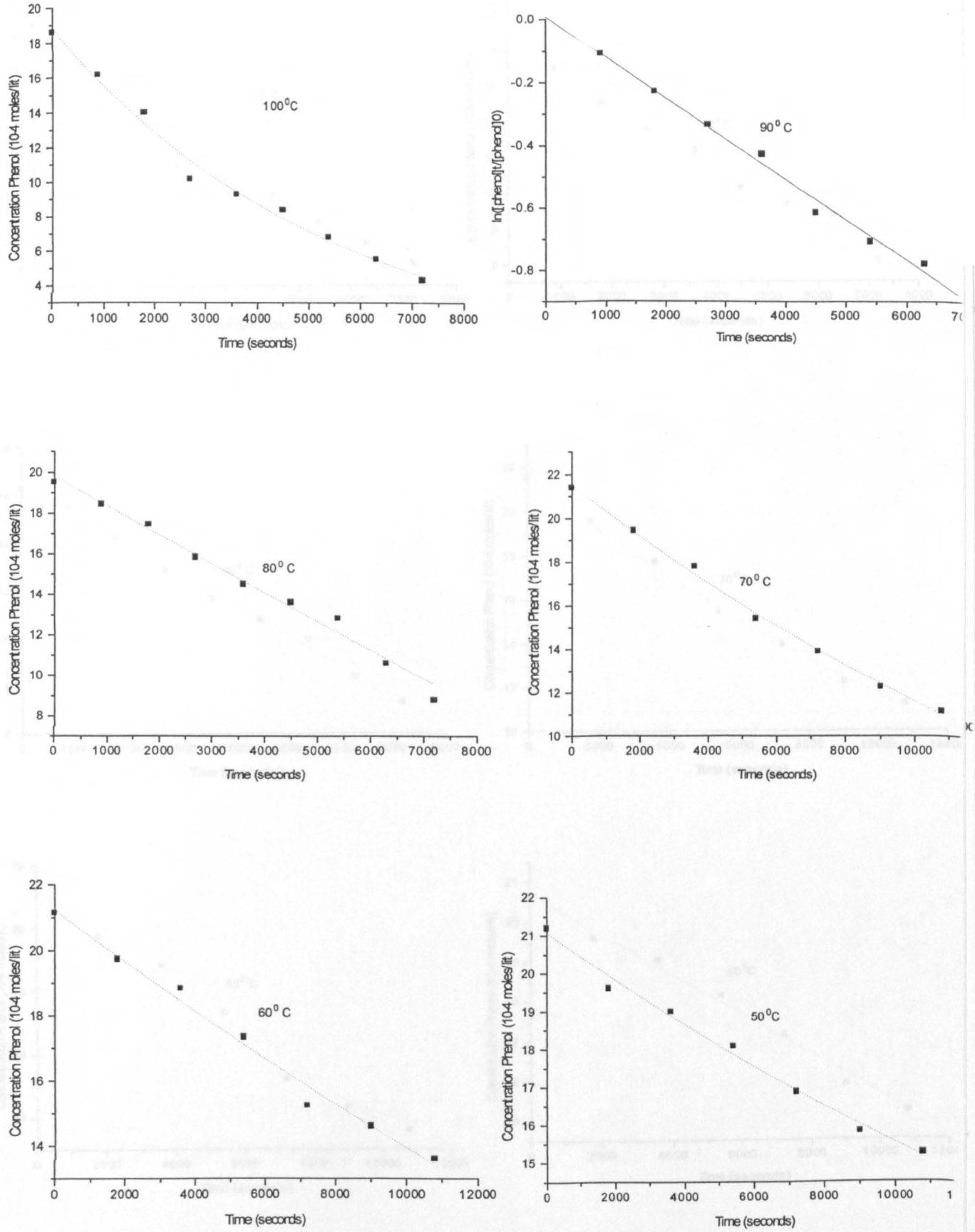


Figure A. 1.1: Kinetic profile for reaction of phenol with butyric anhydride at various temperatures.

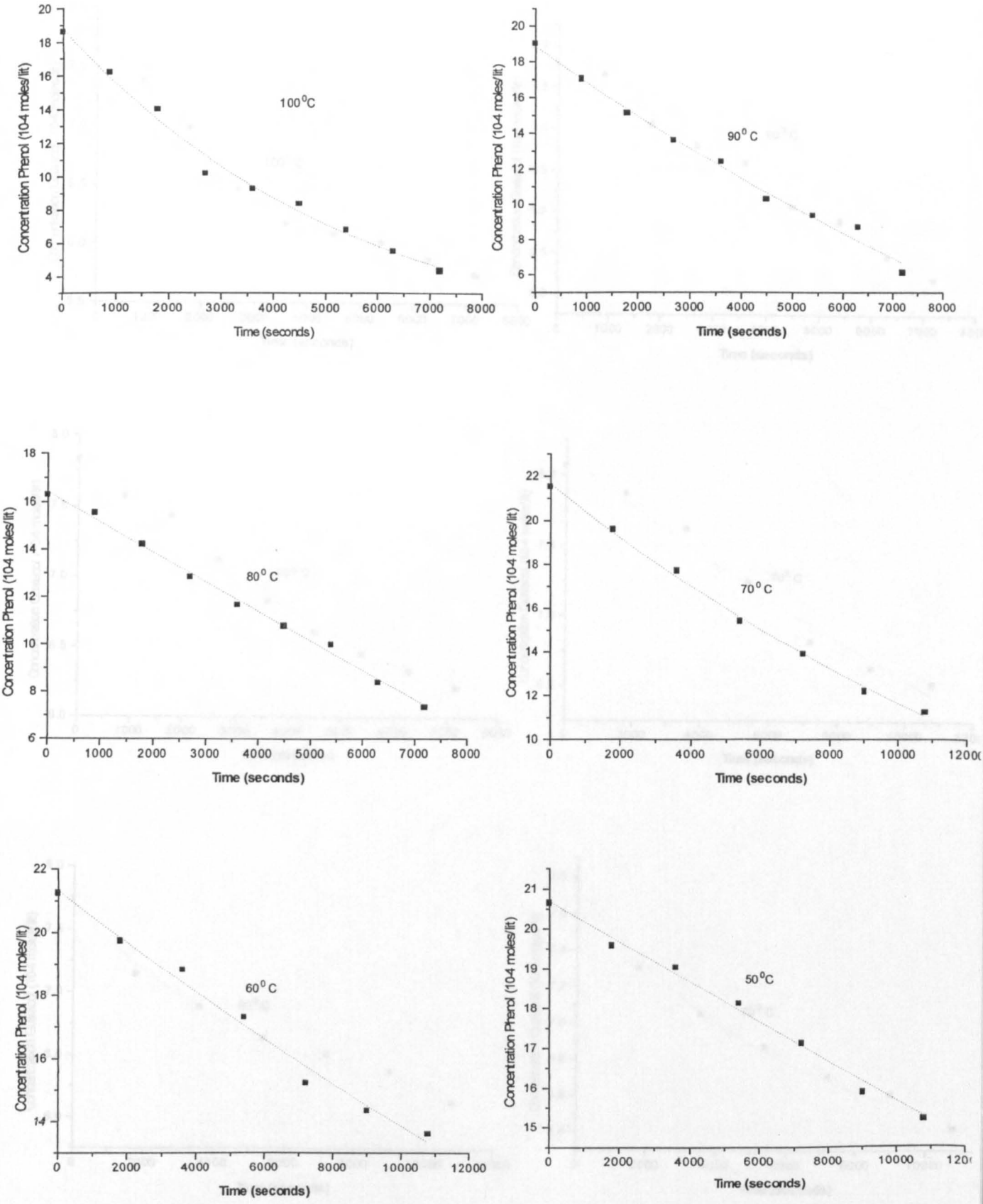


Figure A. 1.2: Kinetic profile for reaction of phenol with valeric anhydride at various temperatures.

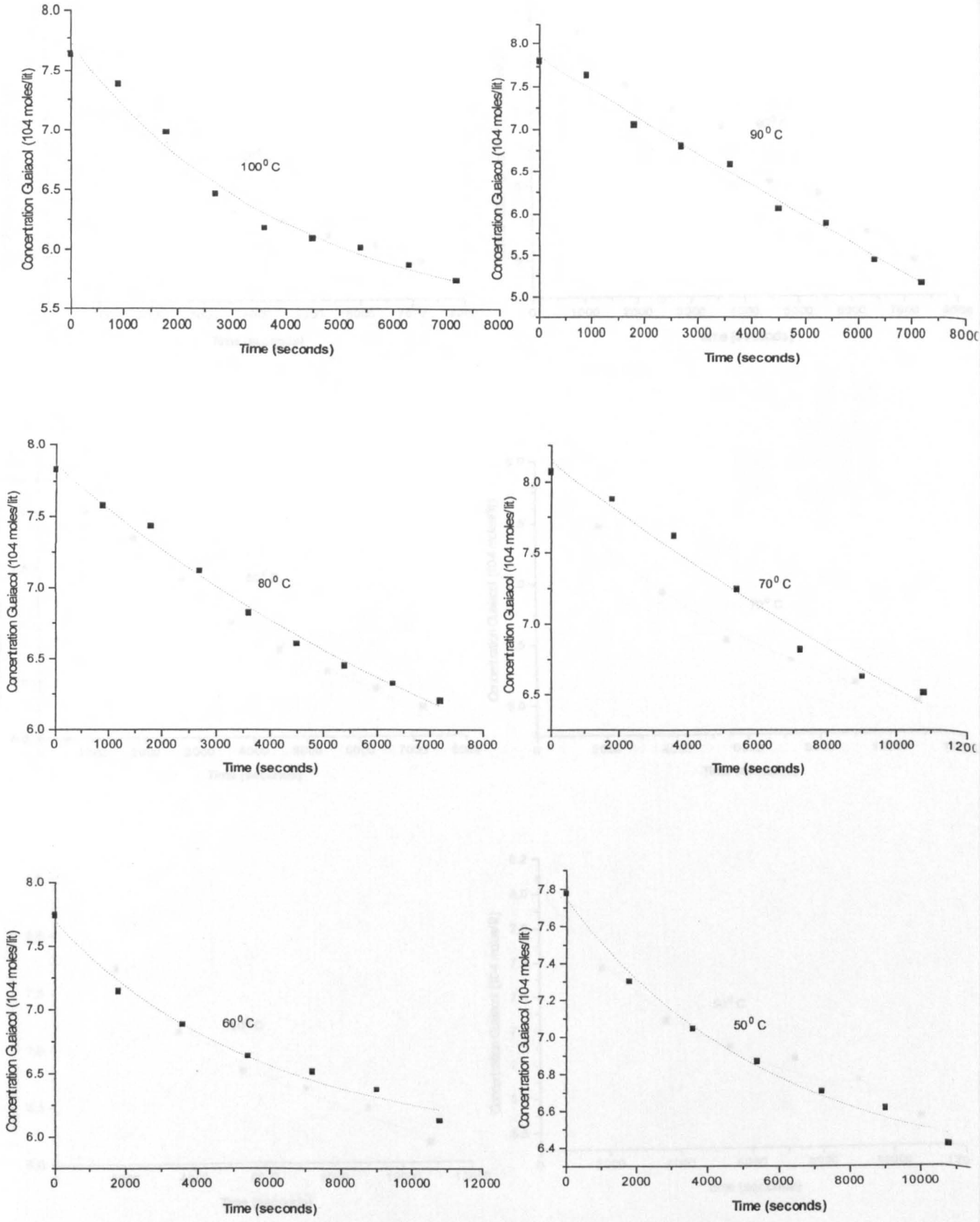
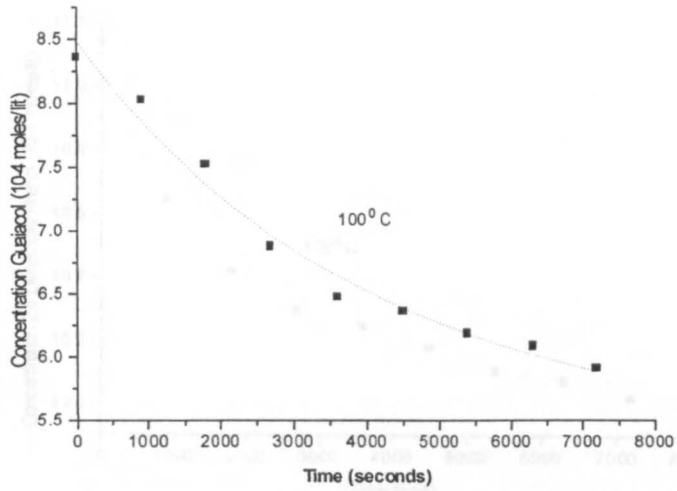
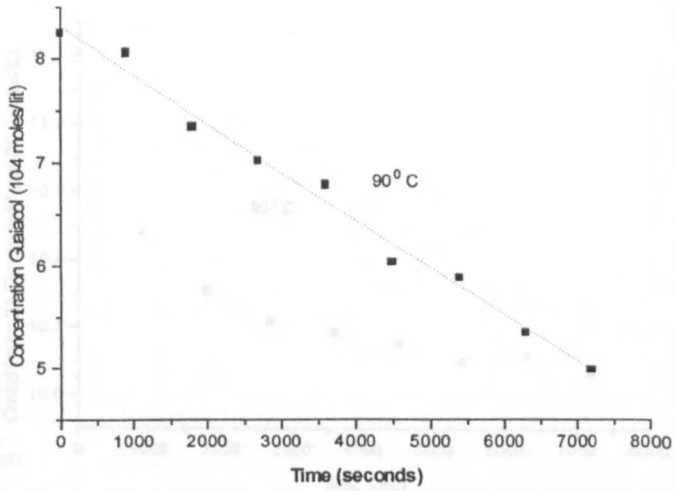
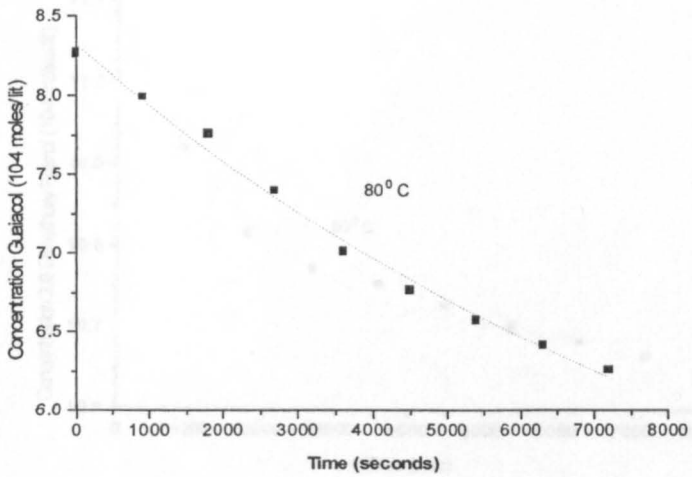
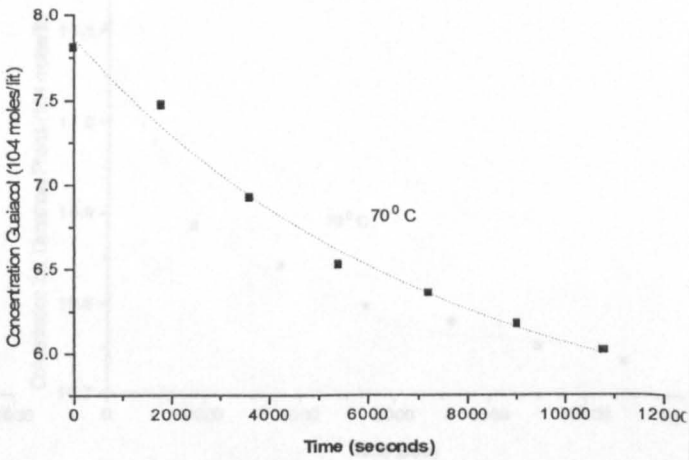


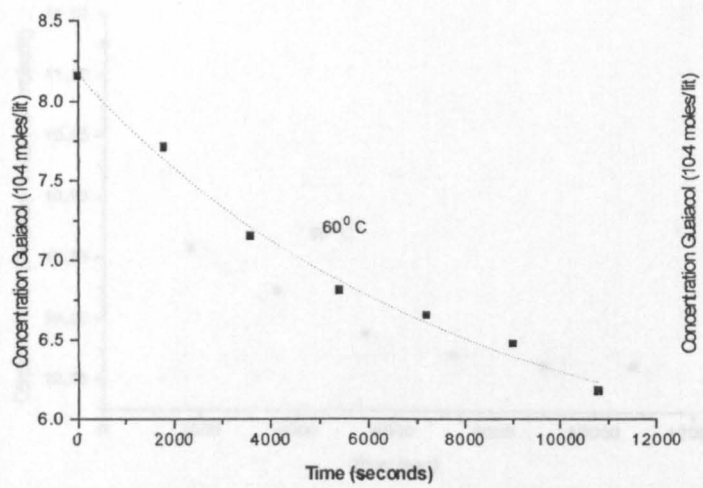
Figure A. 1.3: Kinetic profile for reaction of guaiacol with butyric anhydride at various temperatures.











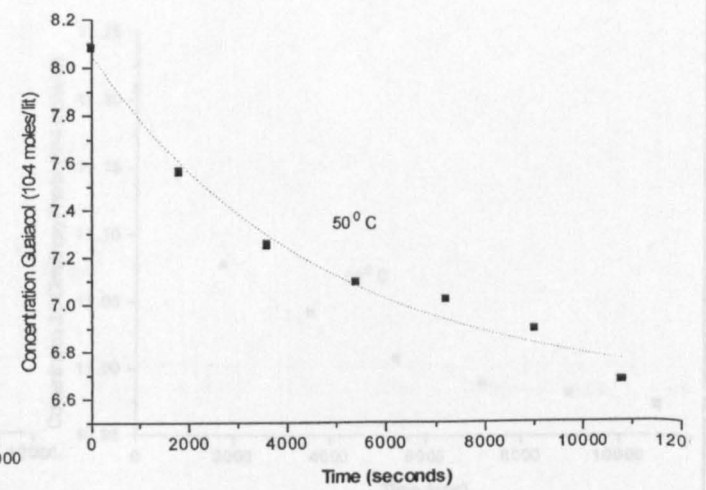


Figure A. 1.4: Kinetic profile for reaction of guaiacol with valeric anhydride at various temperatures.

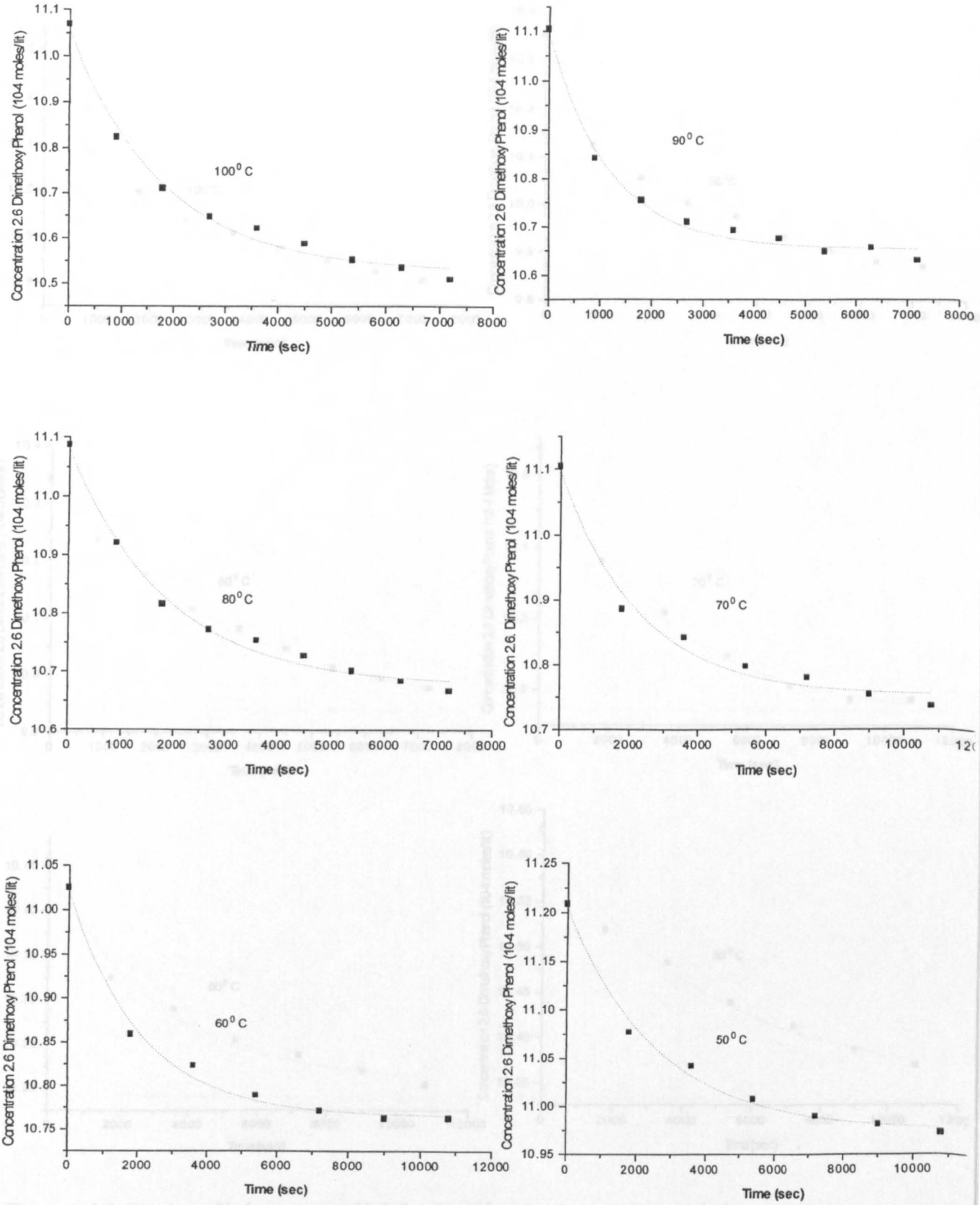


Figure A. 1.5: Kinetic profile for reaction of 2,6-dimethoxyphenol with acetic anhydride at various temperatures.

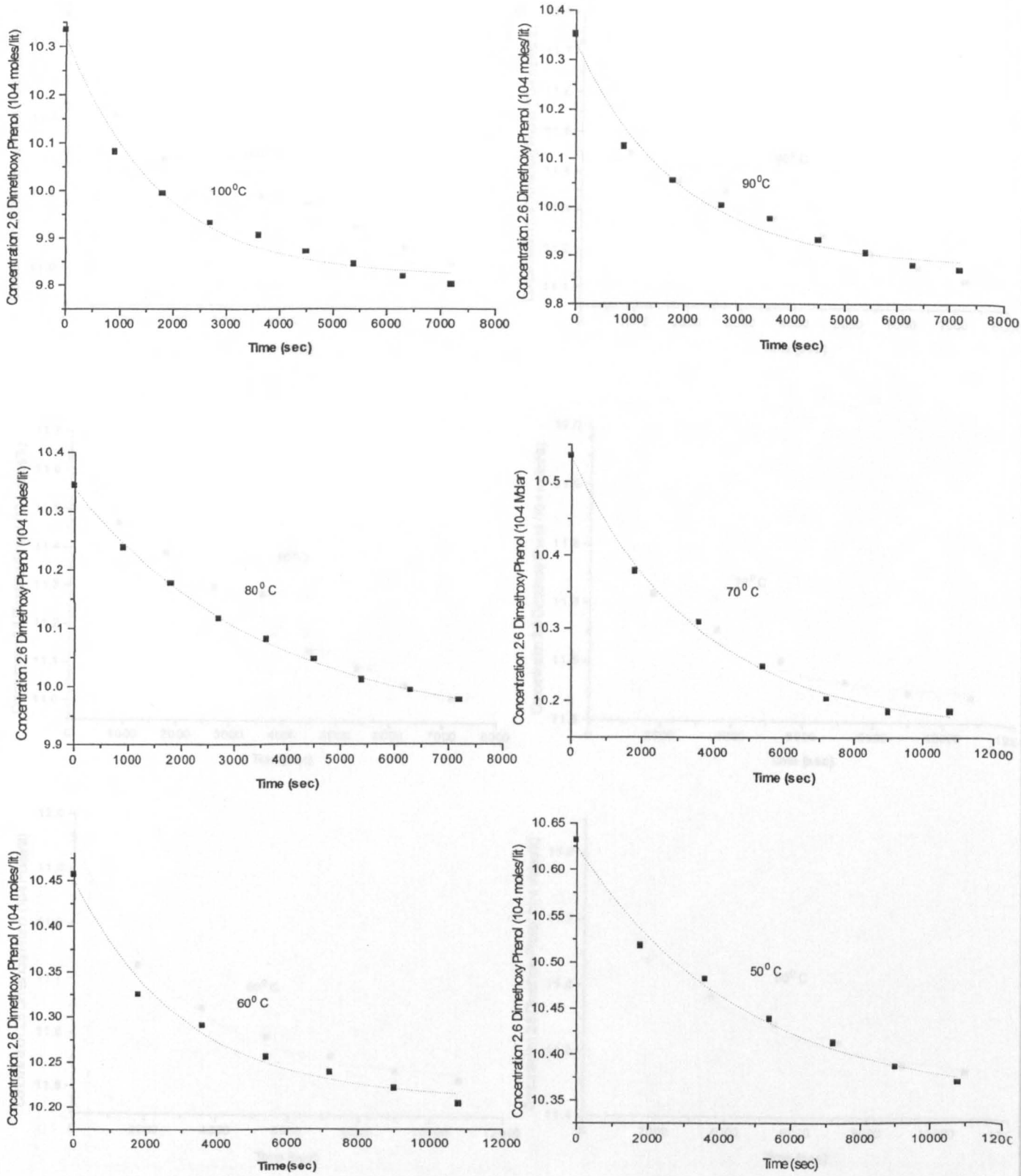


Figure A. 1.6: Kinetic profile for reaction of 2,6-dimethoxyphenol with propionic anhydride at various temperatures.

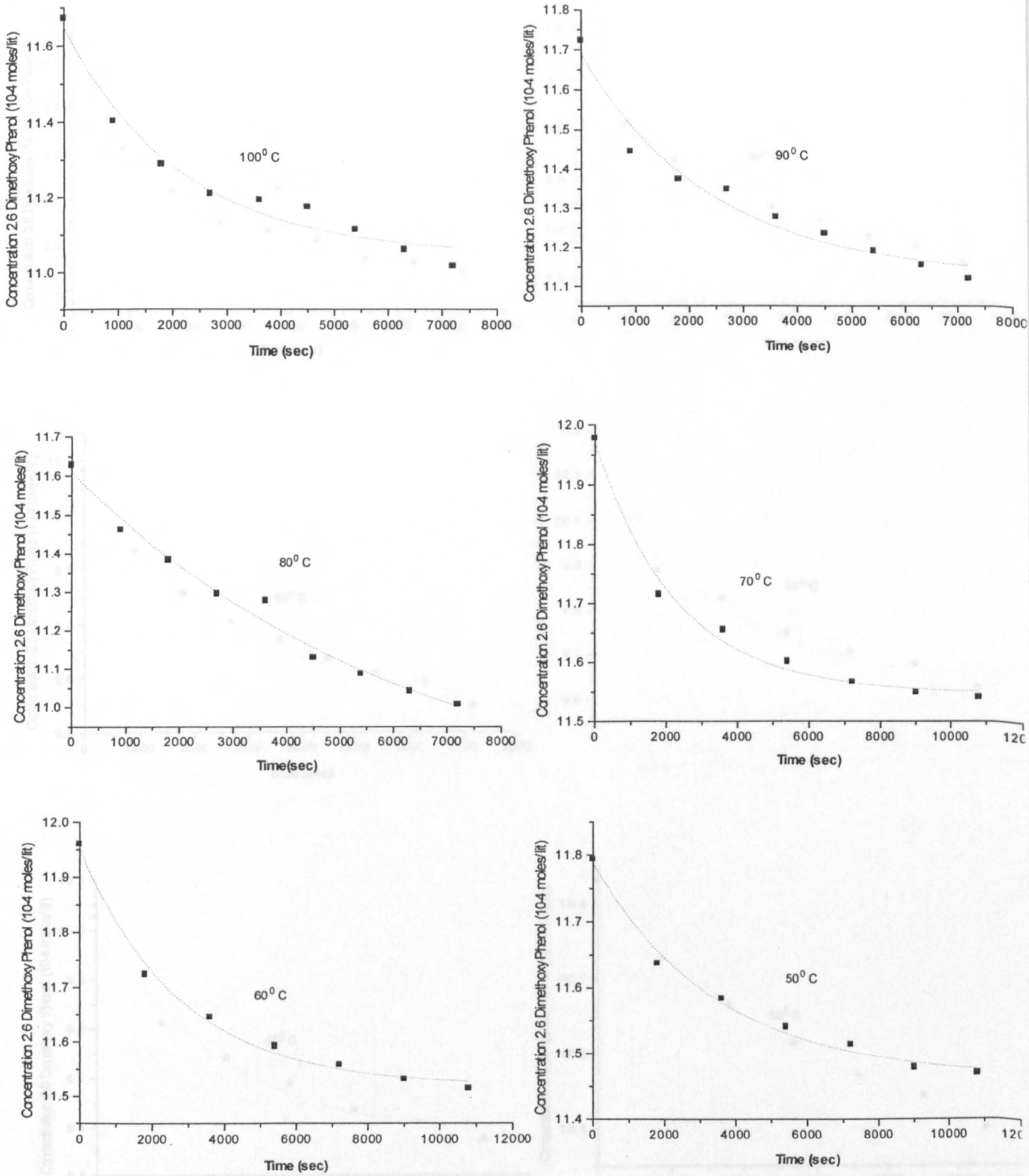


Figure A. 1.7: Kinetic profile for reaction of 2,6-dimethoxyphenol with butyric anhydride at various temperatures.

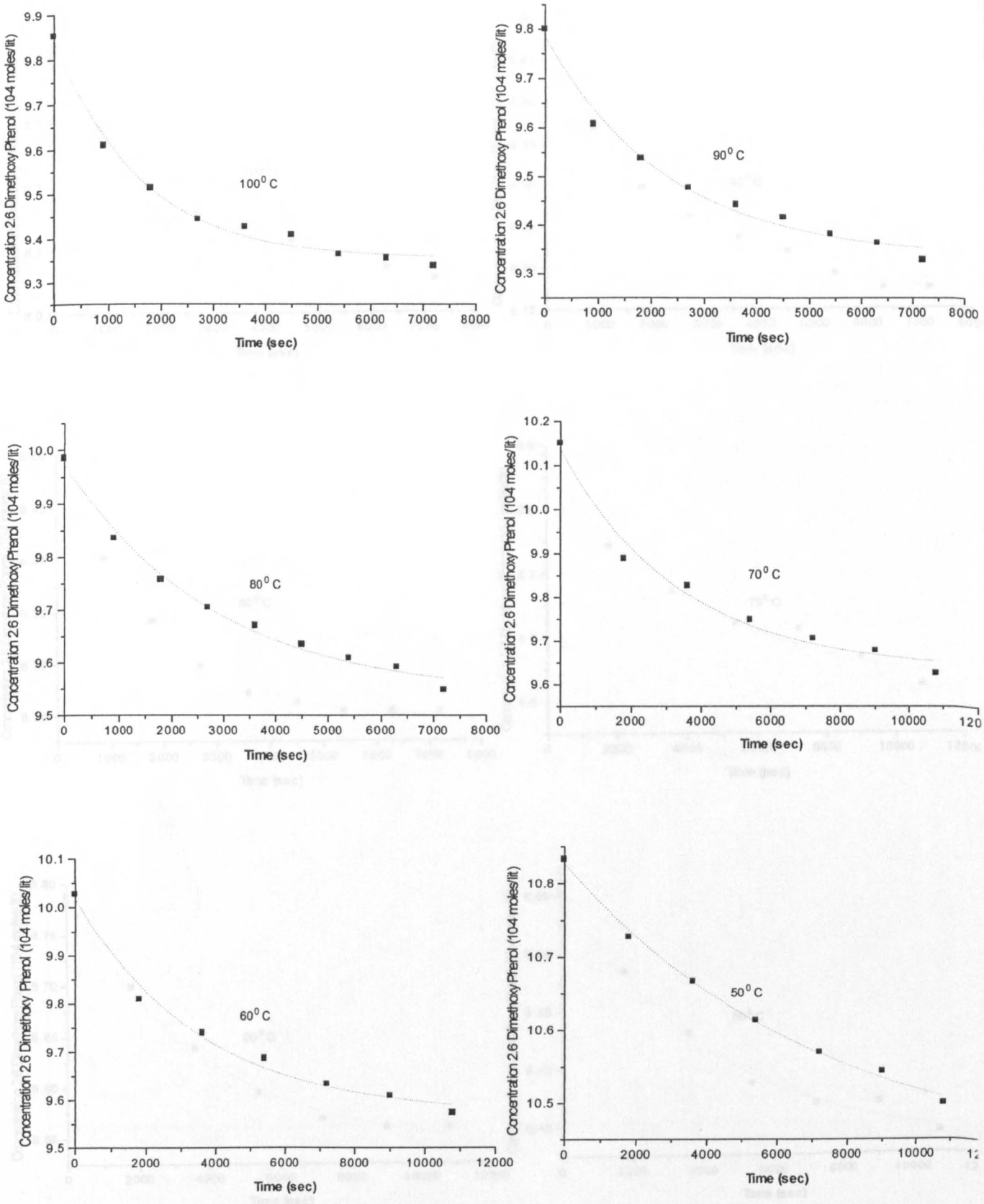


Figure A. 1.8: Kinetic profile for reaction of 2,6-dimethoxyphenol with valeric anhydride at various temperatures.

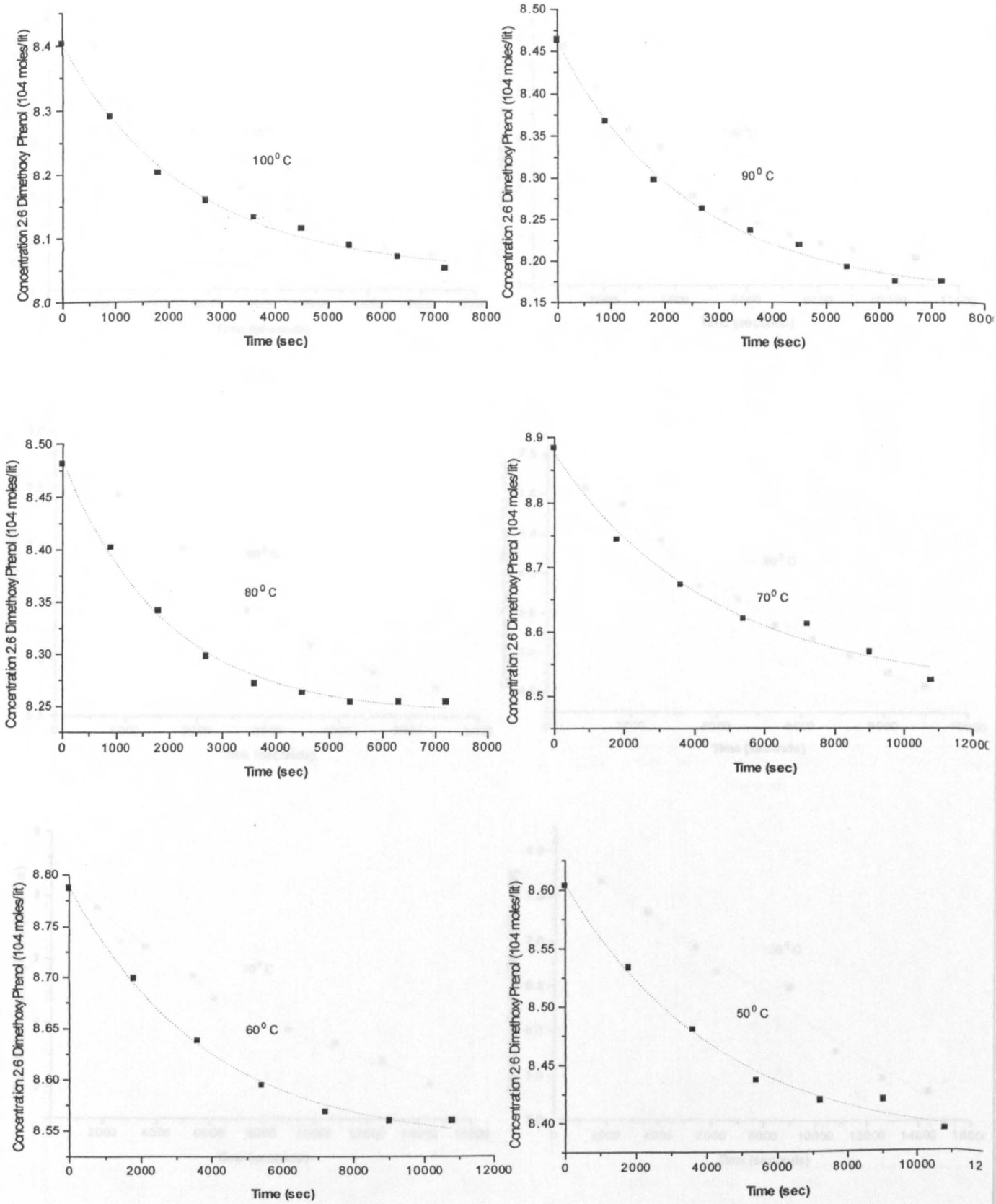


Figure A. 1.9: Kinetic profile for reaction of 2,6-dimethoxyphenol with hexanoic anhydride at various temperatures.

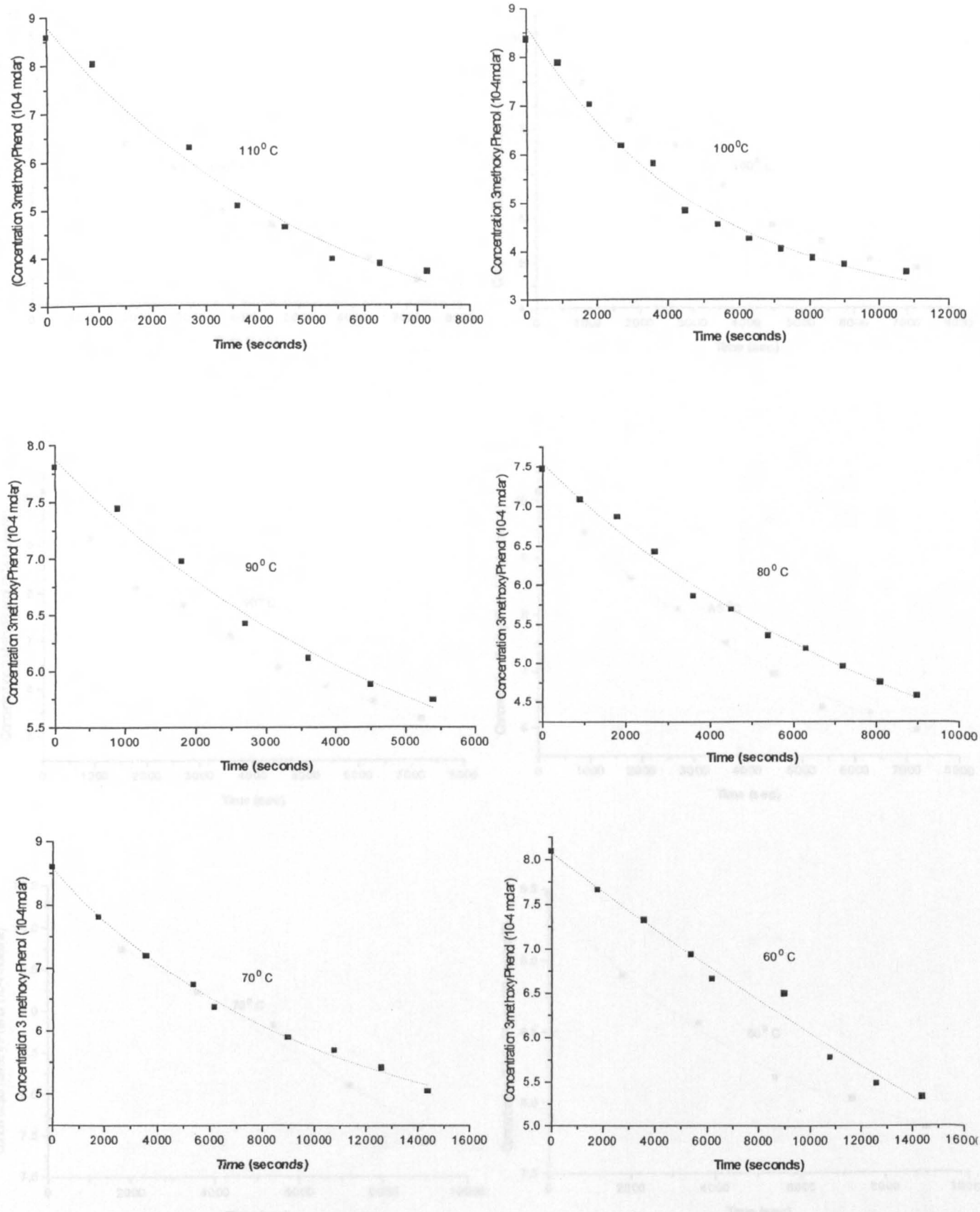


Figure A. 1.10: Kinetic profile for reaction of 3 methoxyphenol with acetic anhydride at various temperatures.

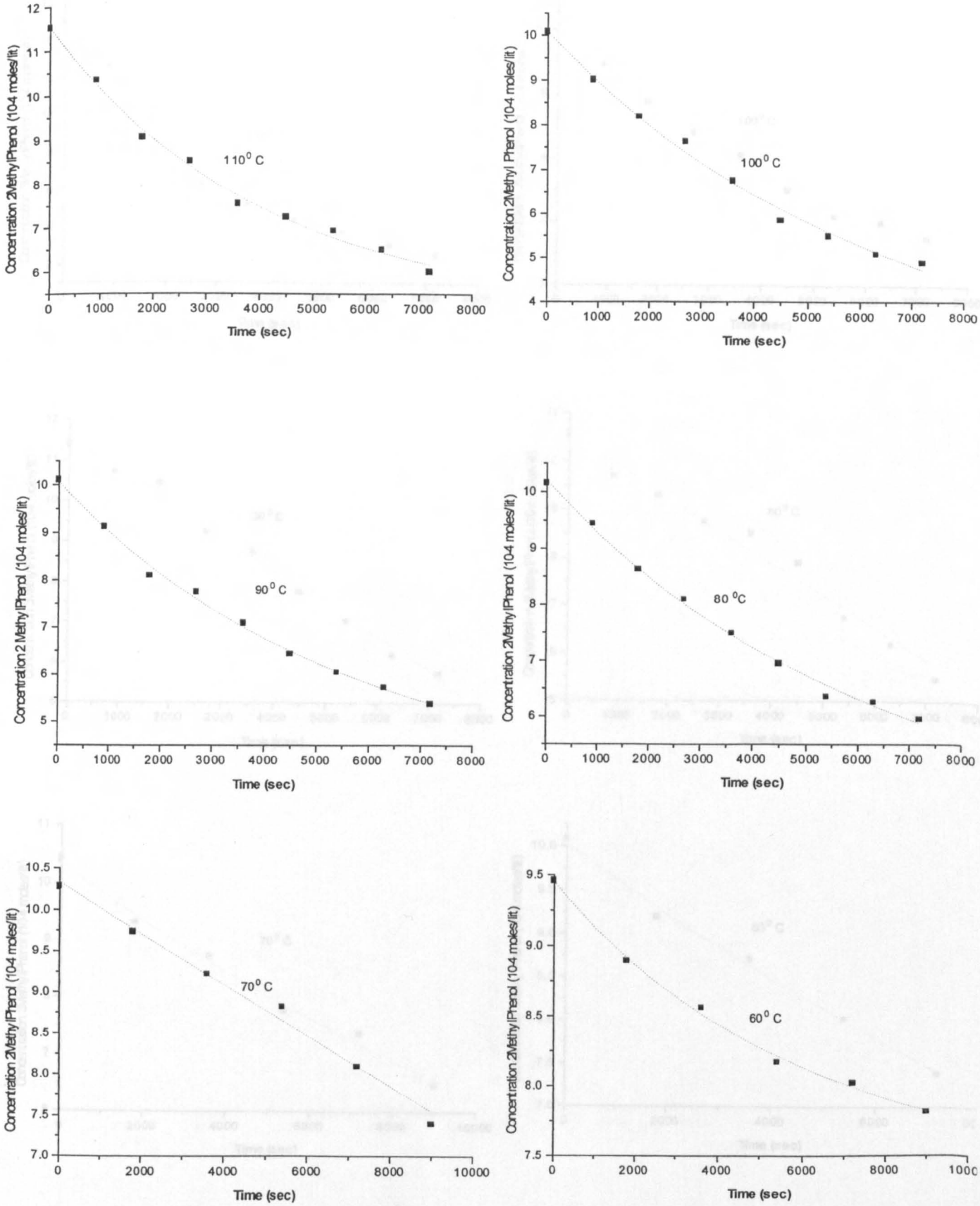


Figure A. 1.11: Kinetic profile for reaction of 2 methylyphenol with acetic anhydride at various temperatures.

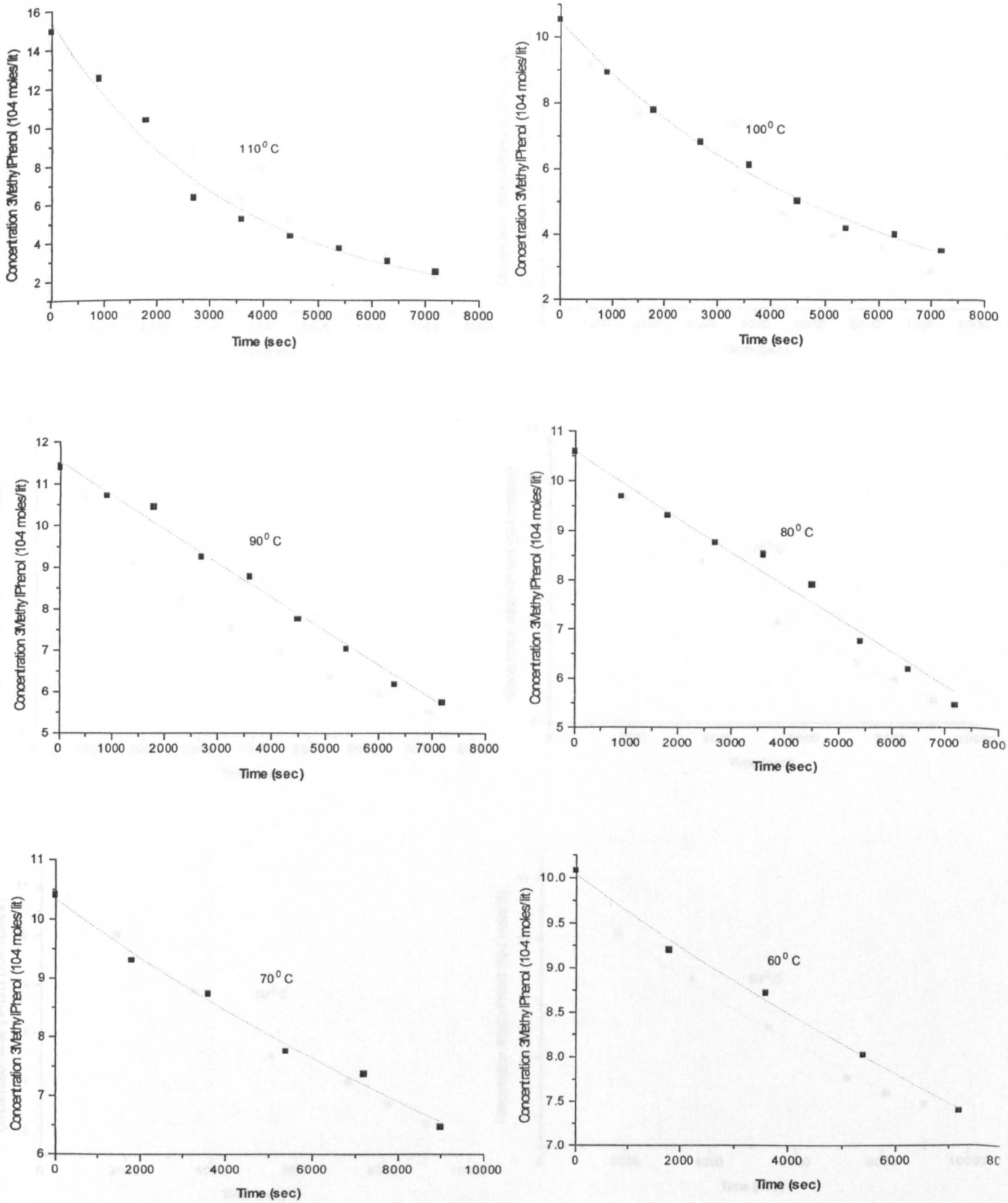


Figure A. 1.12: Kinetic profile for reaction of 3 methylyphenol with acetic anhydride at various temperatures.

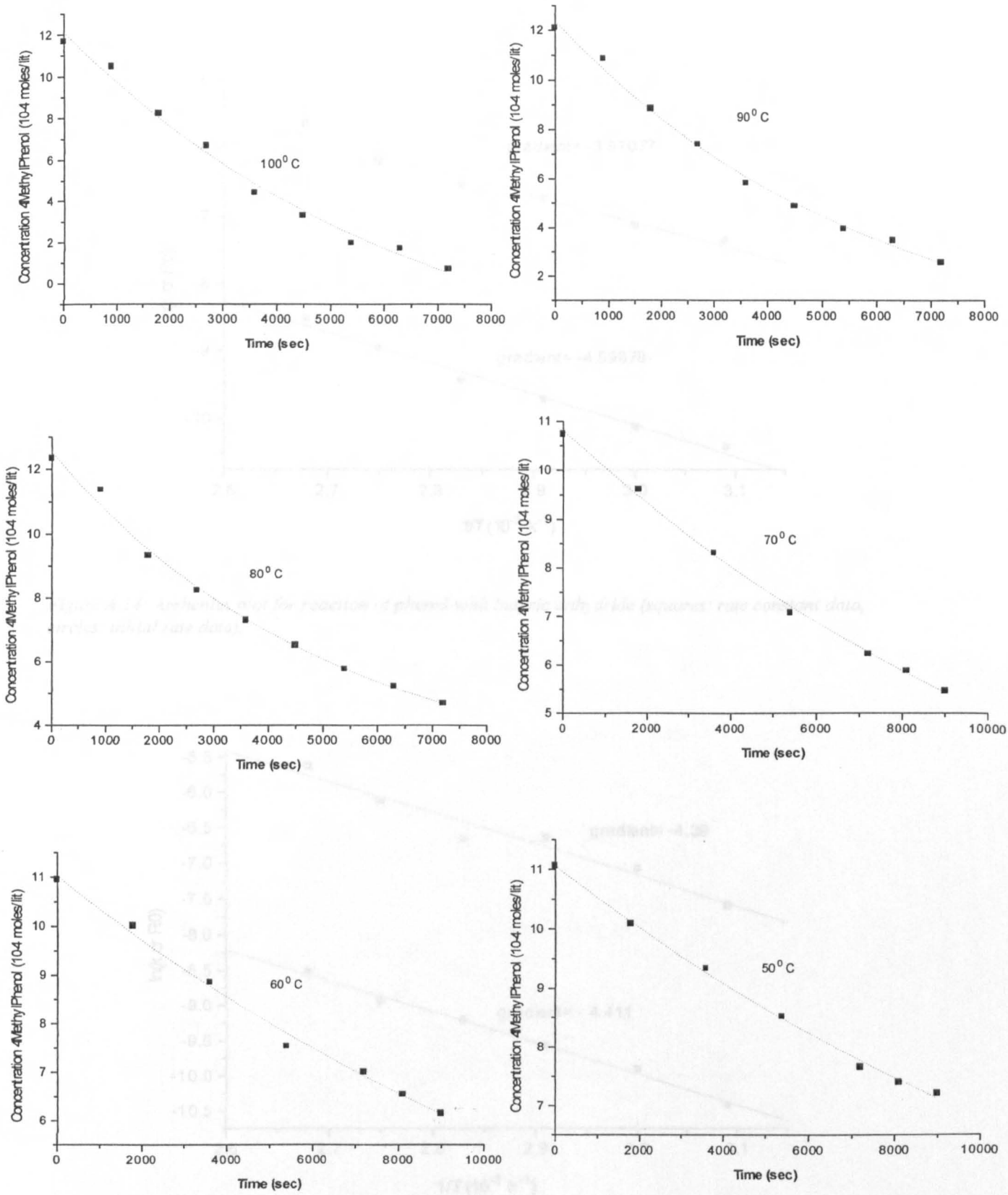


Figure A. 1.13: Kinetic profile for reaction of 4 methylyphenol with acetic anhydride at various temperatures.

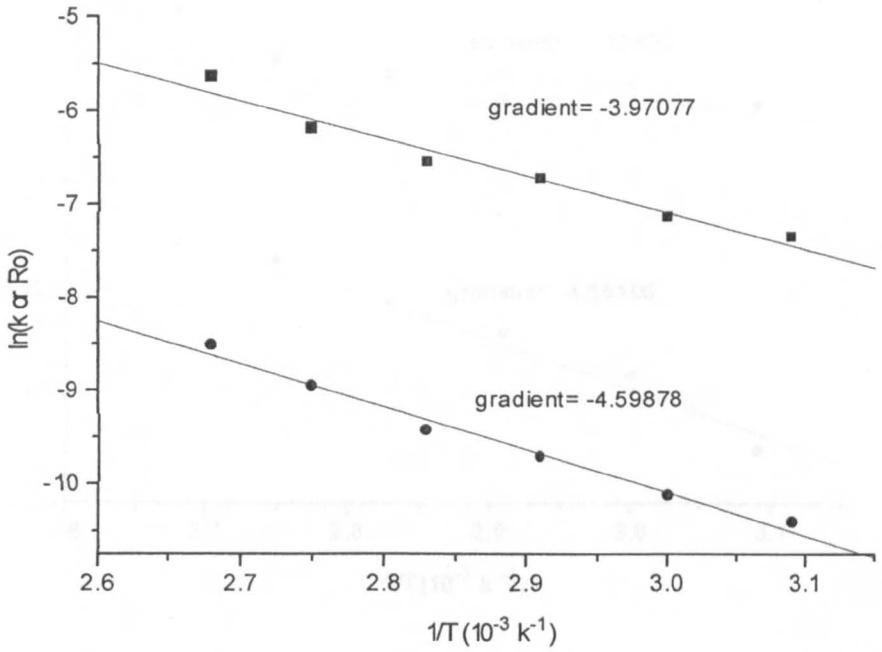


Figure A.14: Arrhenius plot for reaction of phenol with butyric anhydride (squares: rate constant data, circles: initial rate data).

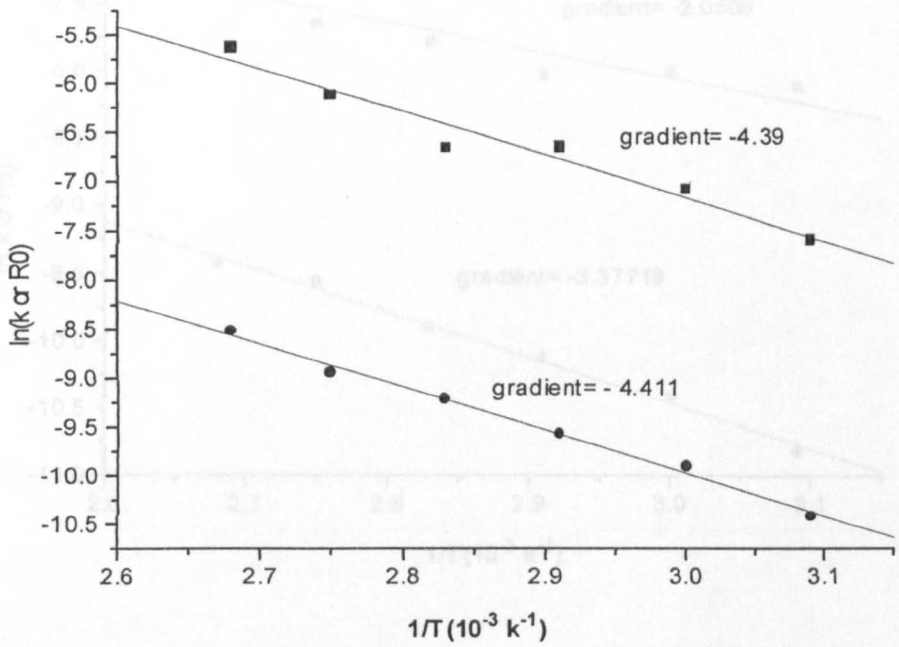


Figure A.15: Arrhenius plot for reaction of phenol with valeric anhydride (squares: rate constant data, circles: initial rate data).

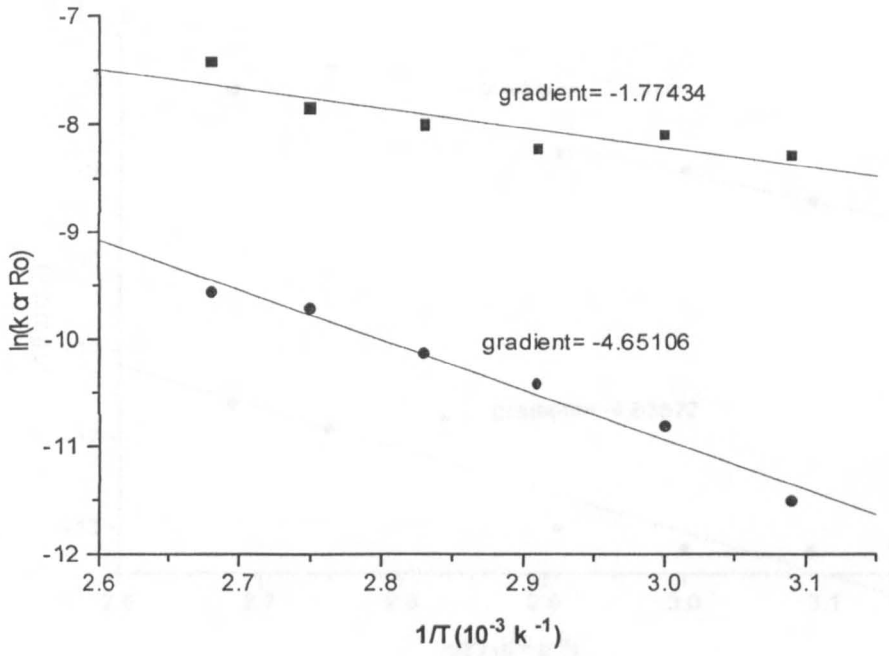


Figure A.16: Arrhenius plot for reaction of guaiacol with butyric anhydride (squares: initial rate data; circles: rate constant data).

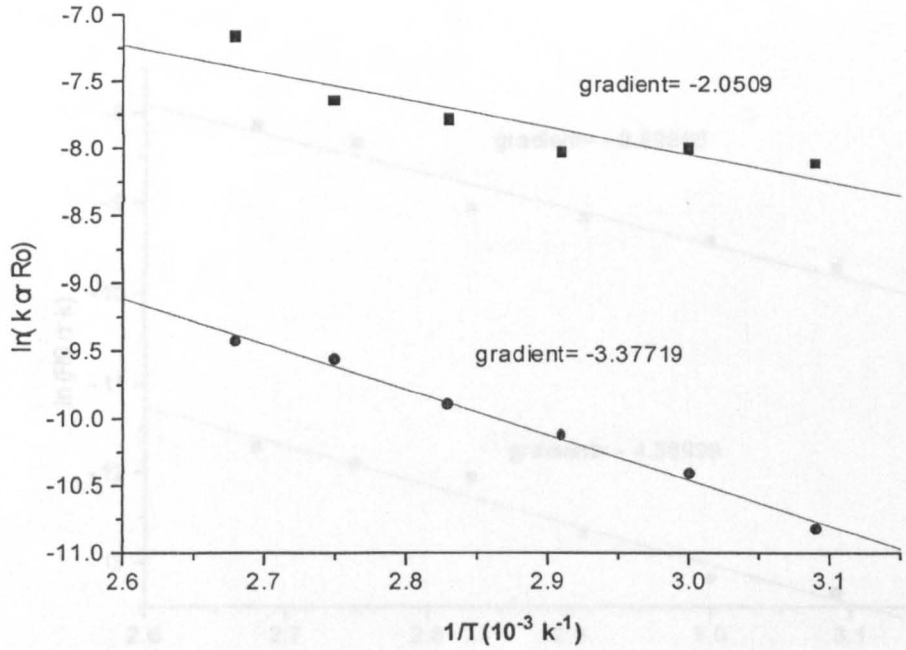


Figure A.17: Arrhenius plot for reaction of guaiacol with valeric anhydride (squares: initial rate data; circles: rate constant data).

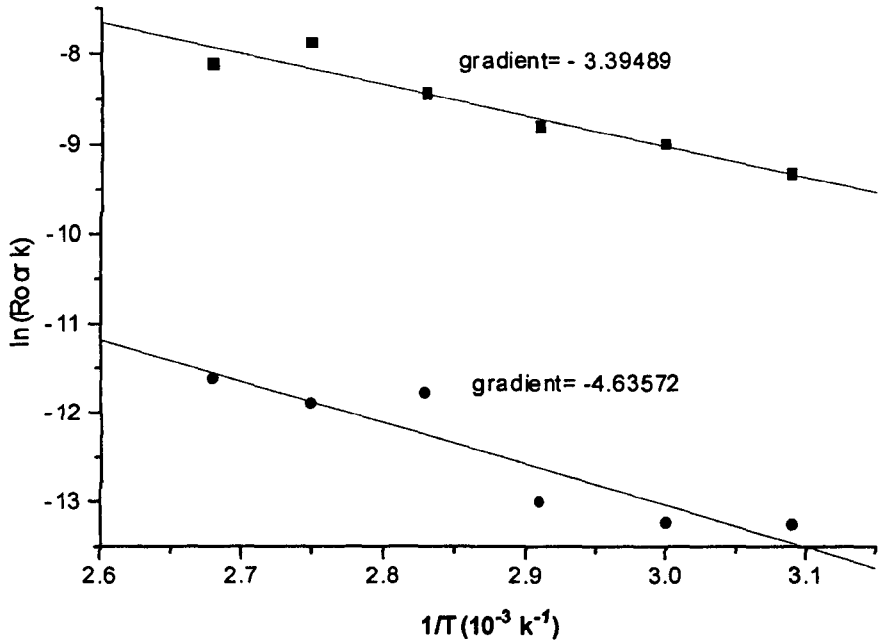


Figure A.18: Arrhenius plot for reaction of 2,6-dimethoxyphenol with acetic anhydride (squares: initial rate data; circles: rate constant data).

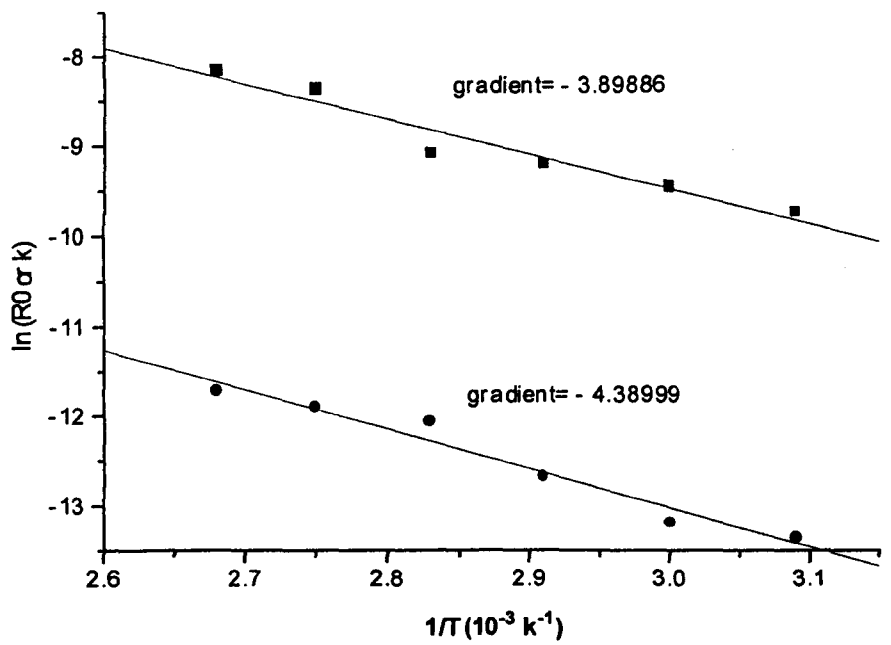


Figure A.19: Arrhenius plot for reaction of 2,6-dimethoxyphenol with propionic anhydride (squares: initial rate data; circles: rate constant data).

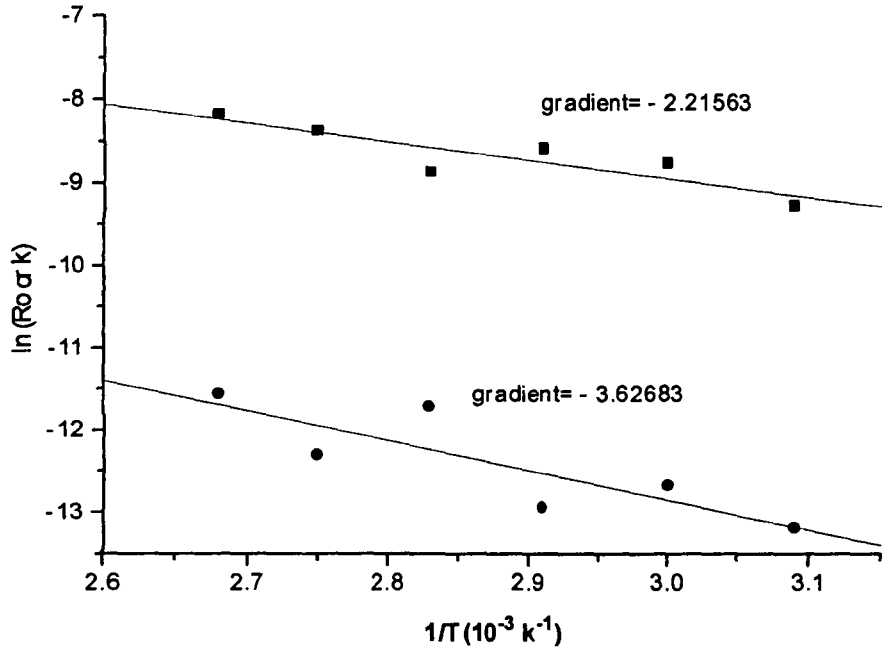


Figure A.20: Arrhenius plot for reaction of 2,6-dimethoxyphenol with butyric anhydride (squares: initial rate data; circles: rate constant data).

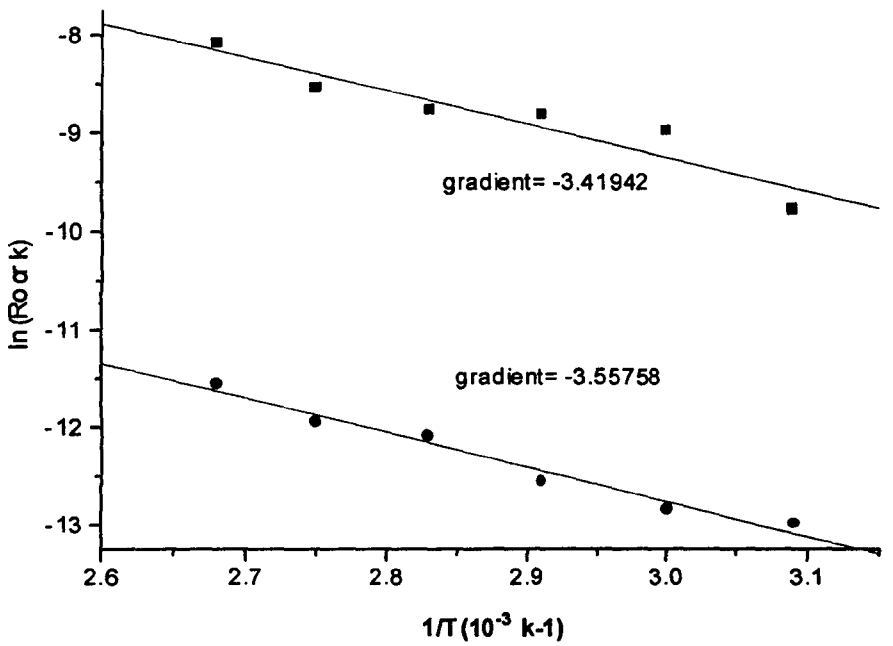


Figure A.21: Arrhenius plot for reaction of 2,6-dimethoxyphenol with valeric anhydride (squares: initial rate data; circles: rate constant data).

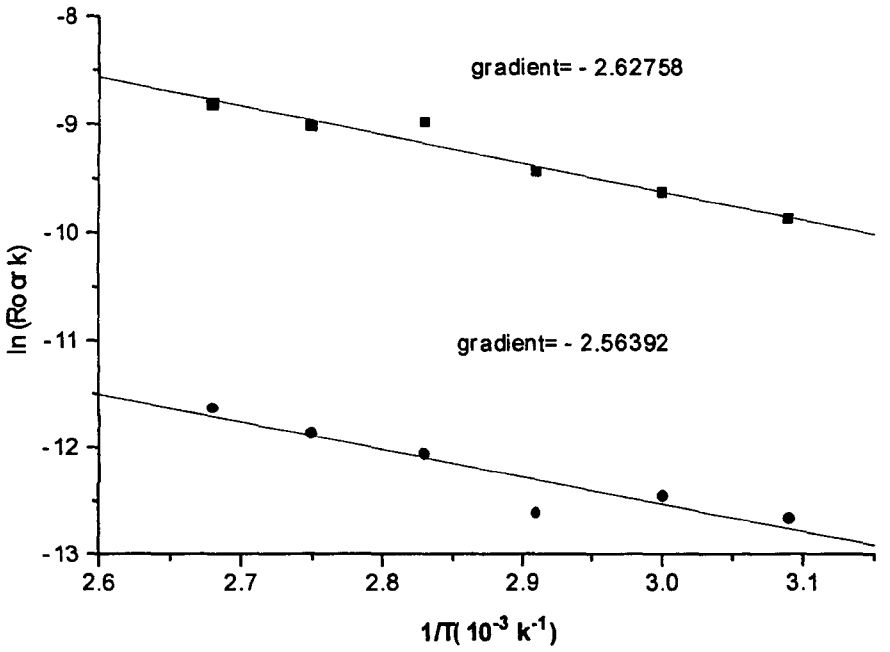


Figure A.22: Arrhenius plot for reaction of 2,6-dimethoxyphenol with hexanoic anhydride (squares: initial rate data; circles: rate constant data).

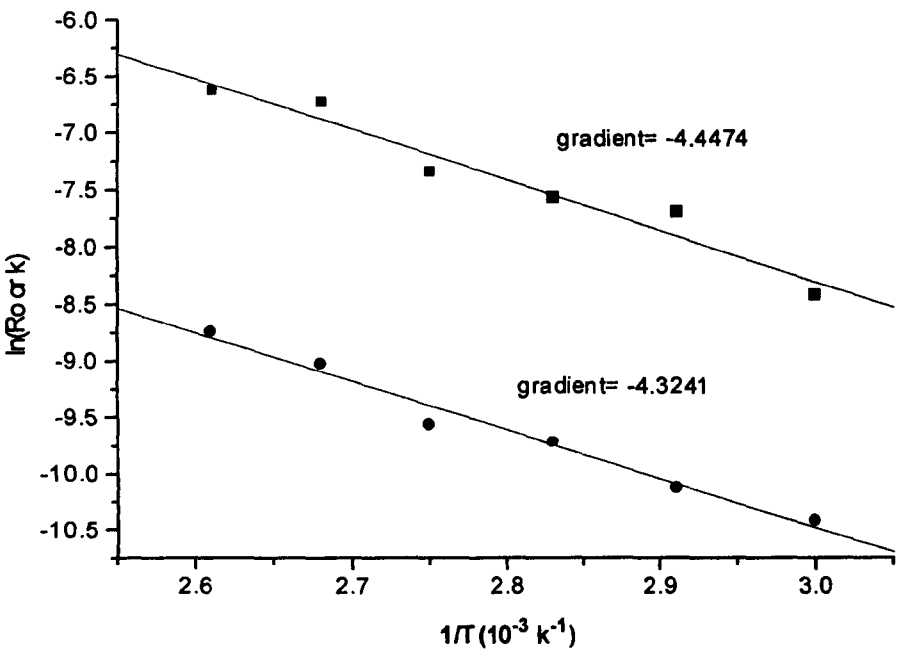


Figure A.23: Arrhenius plot for reaction of 3methoxyphenol with acetic anhydride (squares: initial rate data; circles: rate constant data).

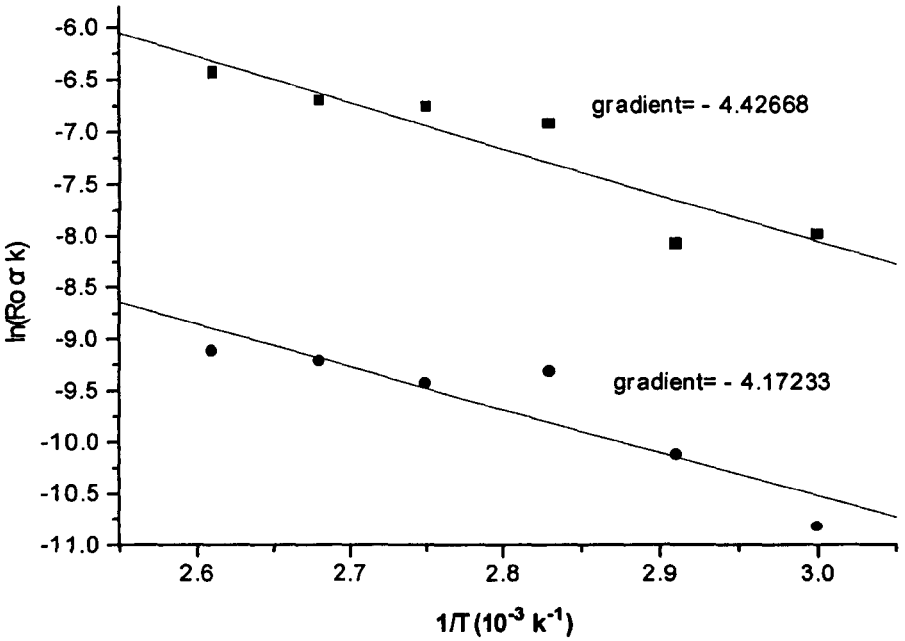


Figure A.24: Arrhenius plot for reaction of 2methylphenol with acetic anhydride (squares: initial rate data; circles: rate constant data).

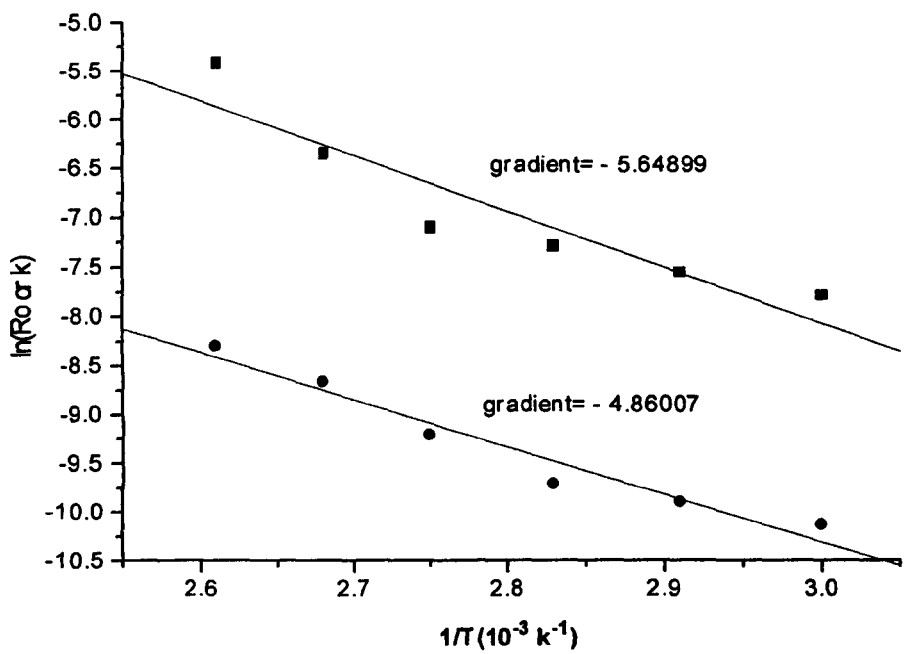


Figure A.25: Arrhenius plot for reaction of 3methylphenol with acetic anhydride (squares: initial rate data; circles: rate constant data).

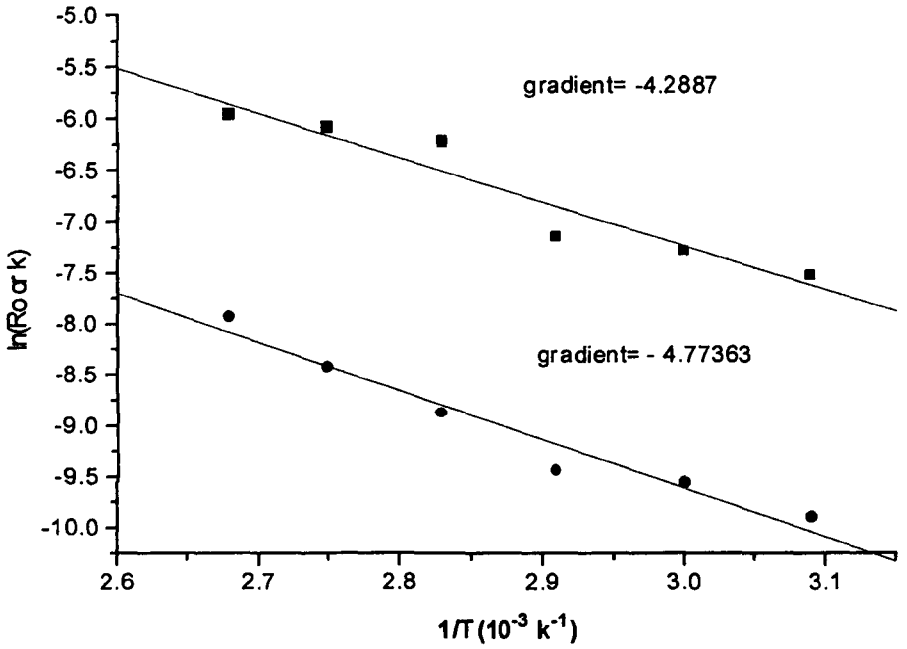


Figure A.26: Arrhenius plot for reaction of 4methylphenol with acetic anhydride (circles: initial rate data; squares: rate constant data).

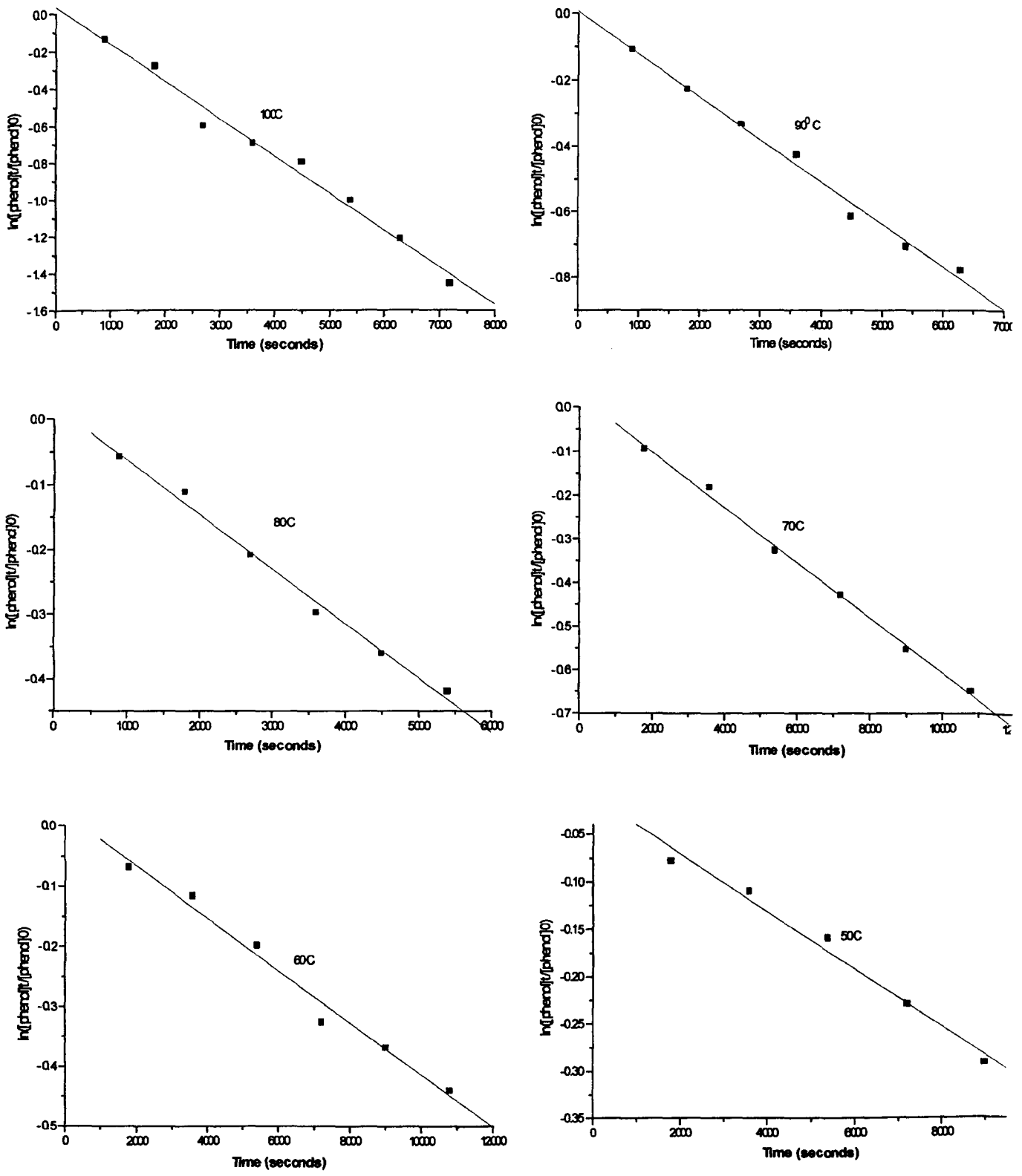


Figure A. 1.27: First order kinetic plot for reaction of phenol with butyric anhydride at various temperatures.

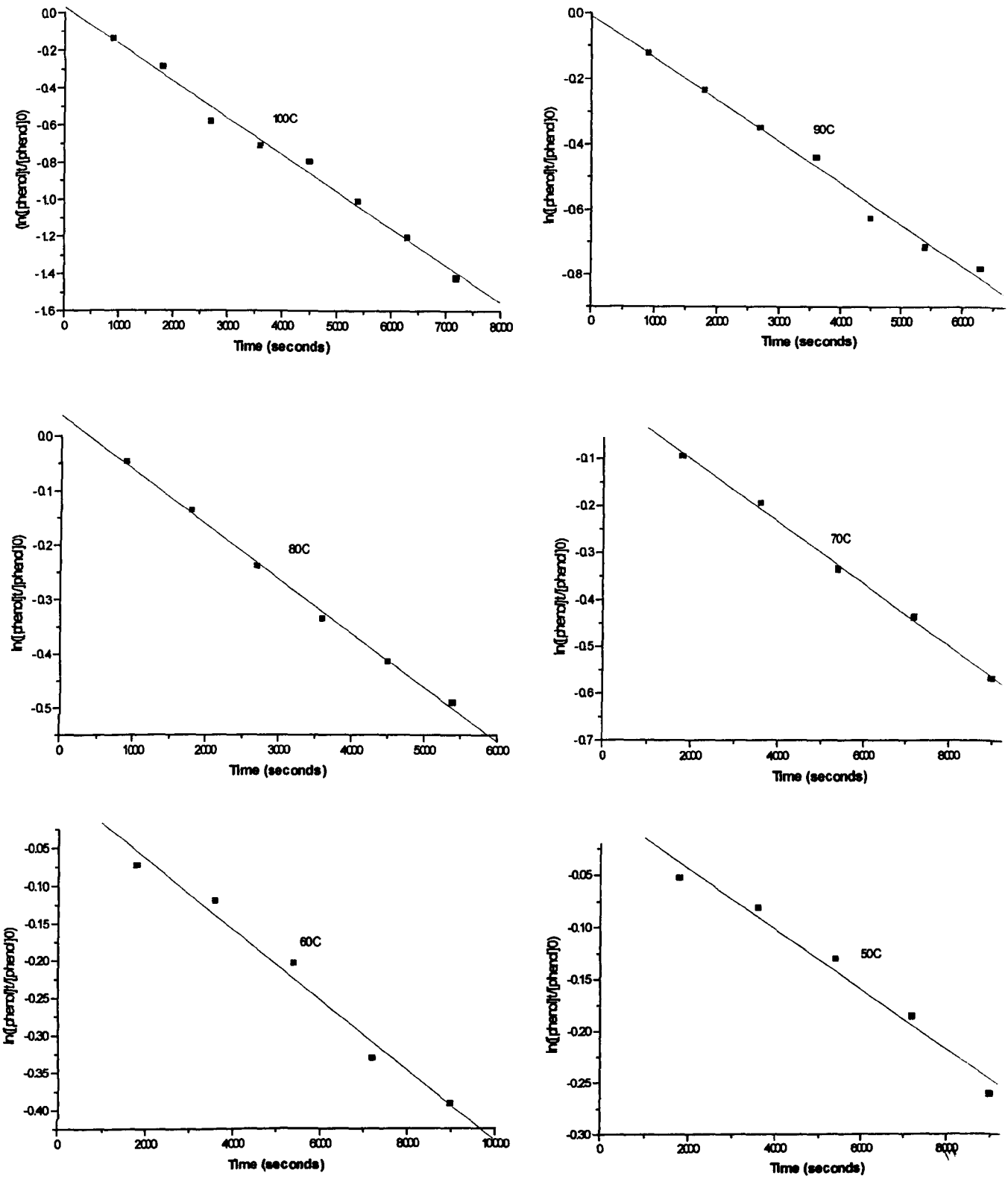


Figure A. 1.28: First order kinetic plot for reaction of phenol with valeric anhydride at various temperatures.

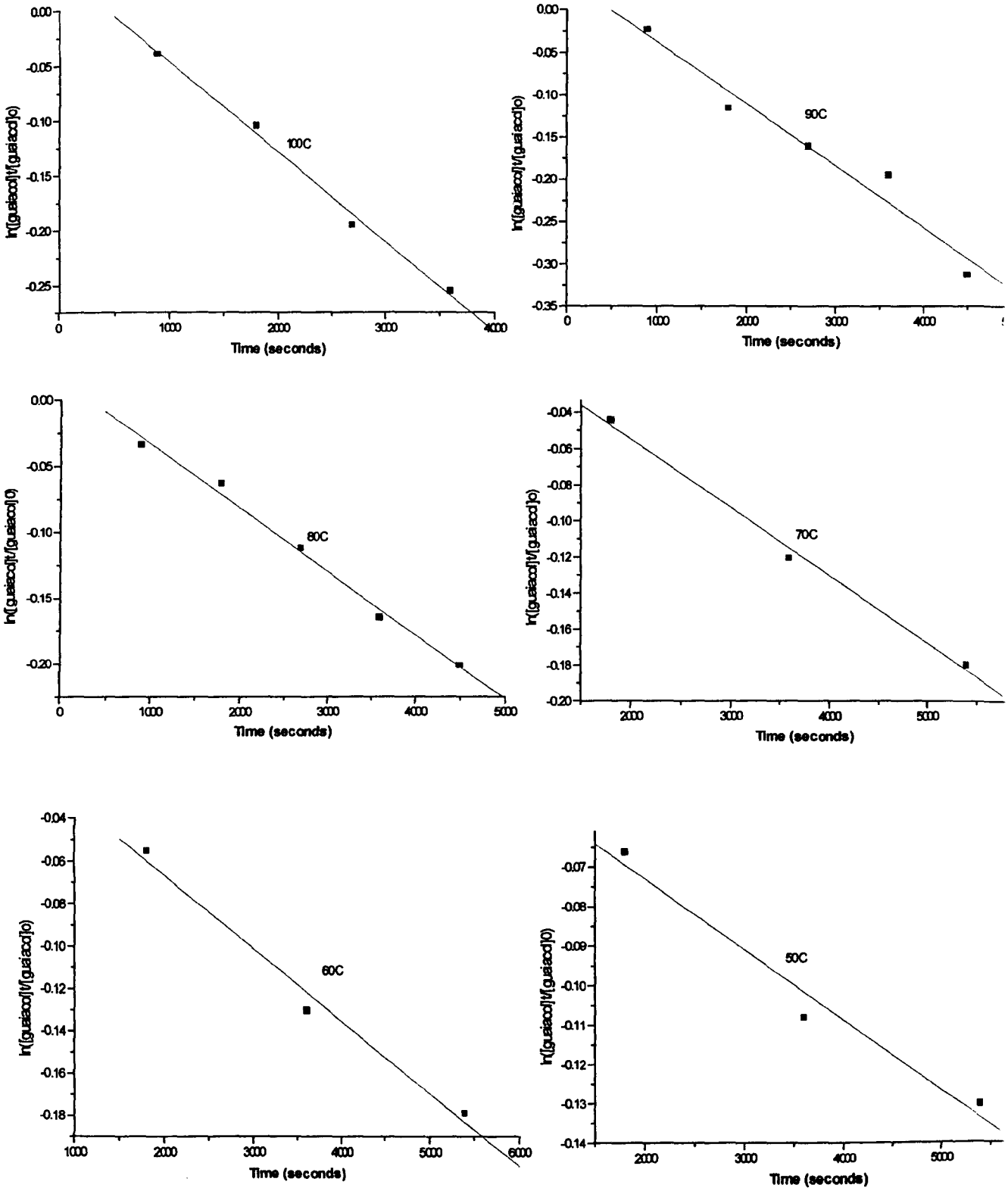


Figure A. 1.29: First order kinetic plot for reaction of guaiacol with butyric anhydride at various temperatures.

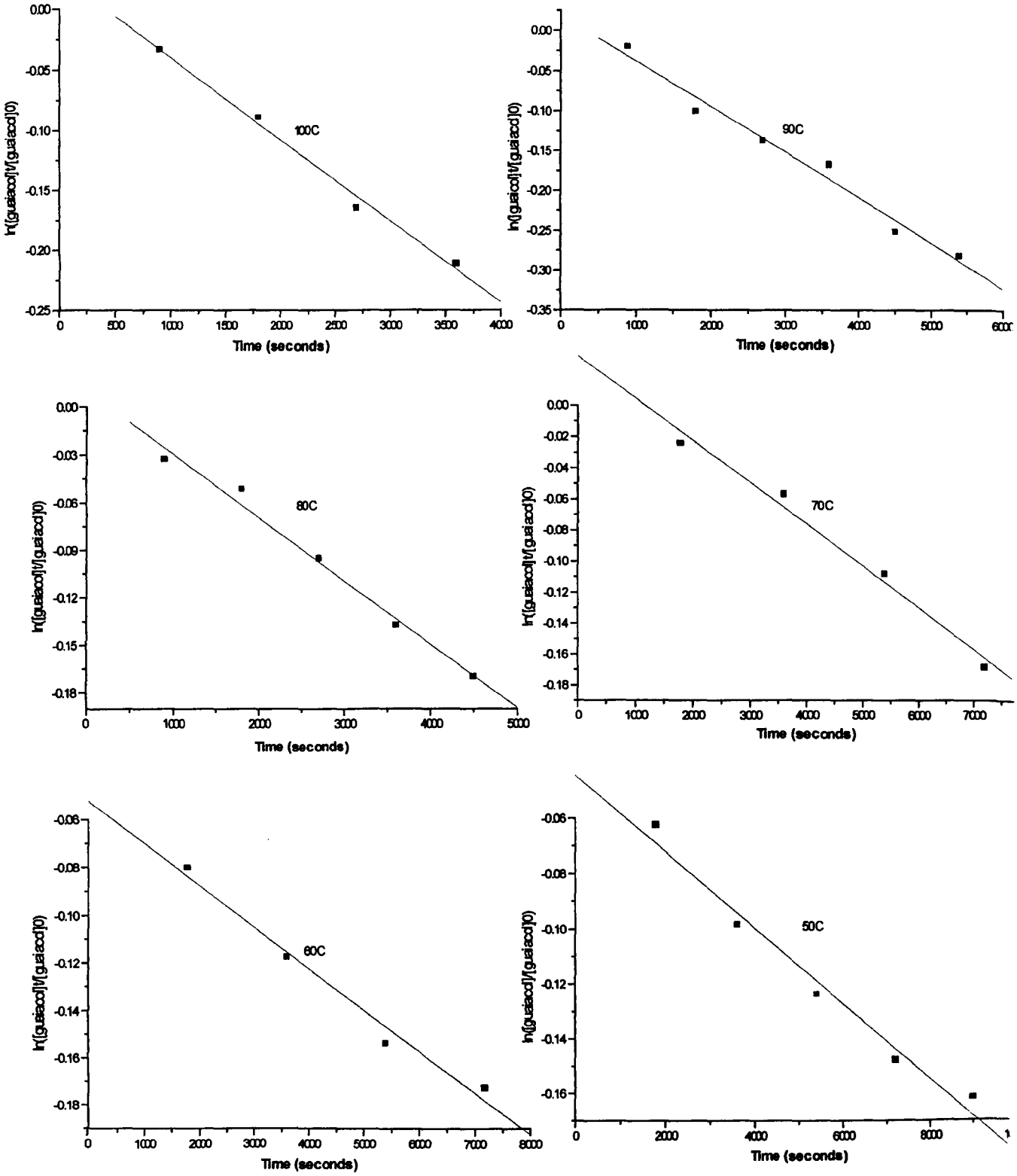


Figure A. 1.30: First order kinetic plot for reaction of guaiacol with valreric anhydride at various temperatures.

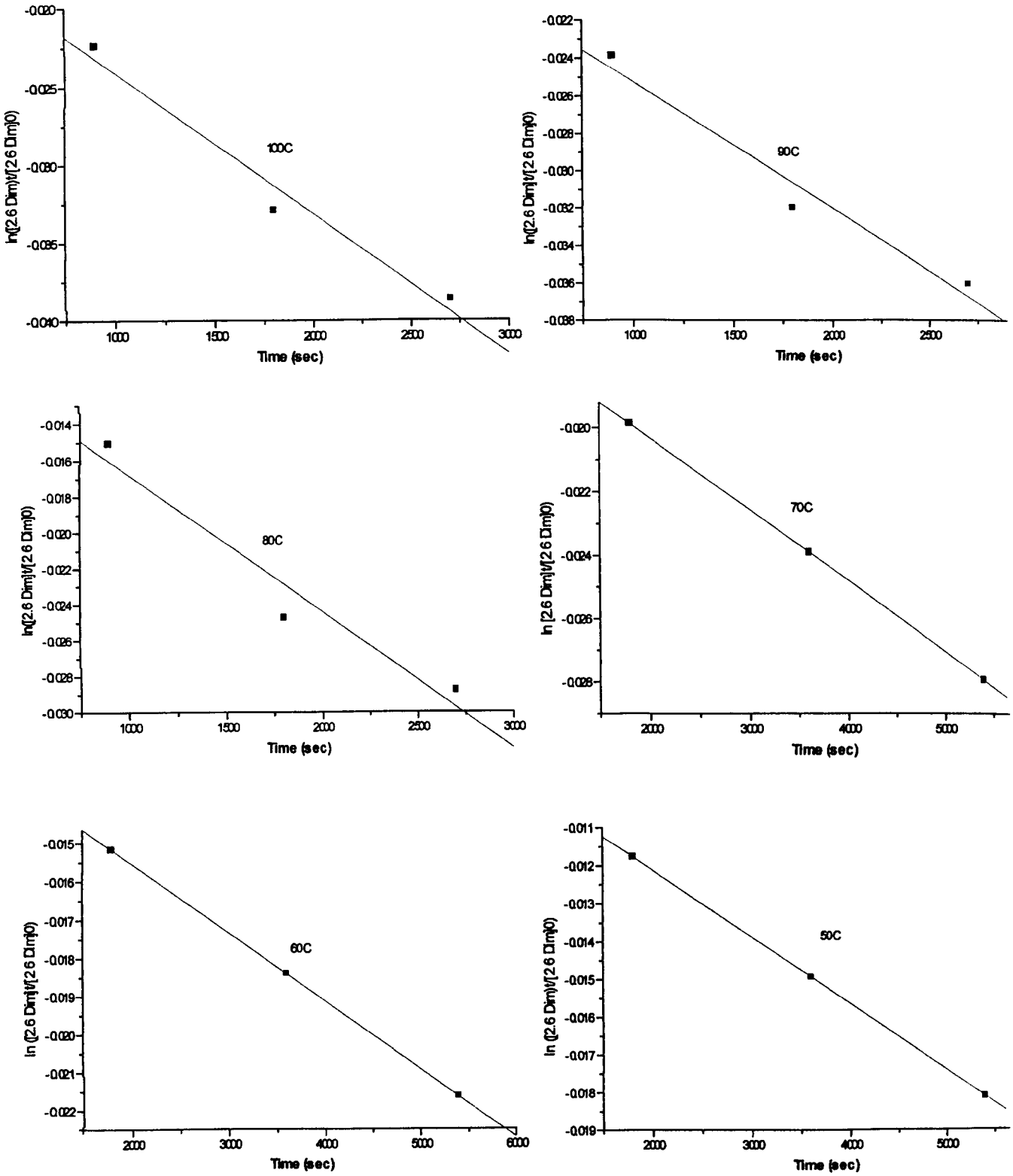


Figure A. 1.31: First order kinetic plot for reaction of 2,6-dimethoxyphenol with aceric anhydride at various temperatures.

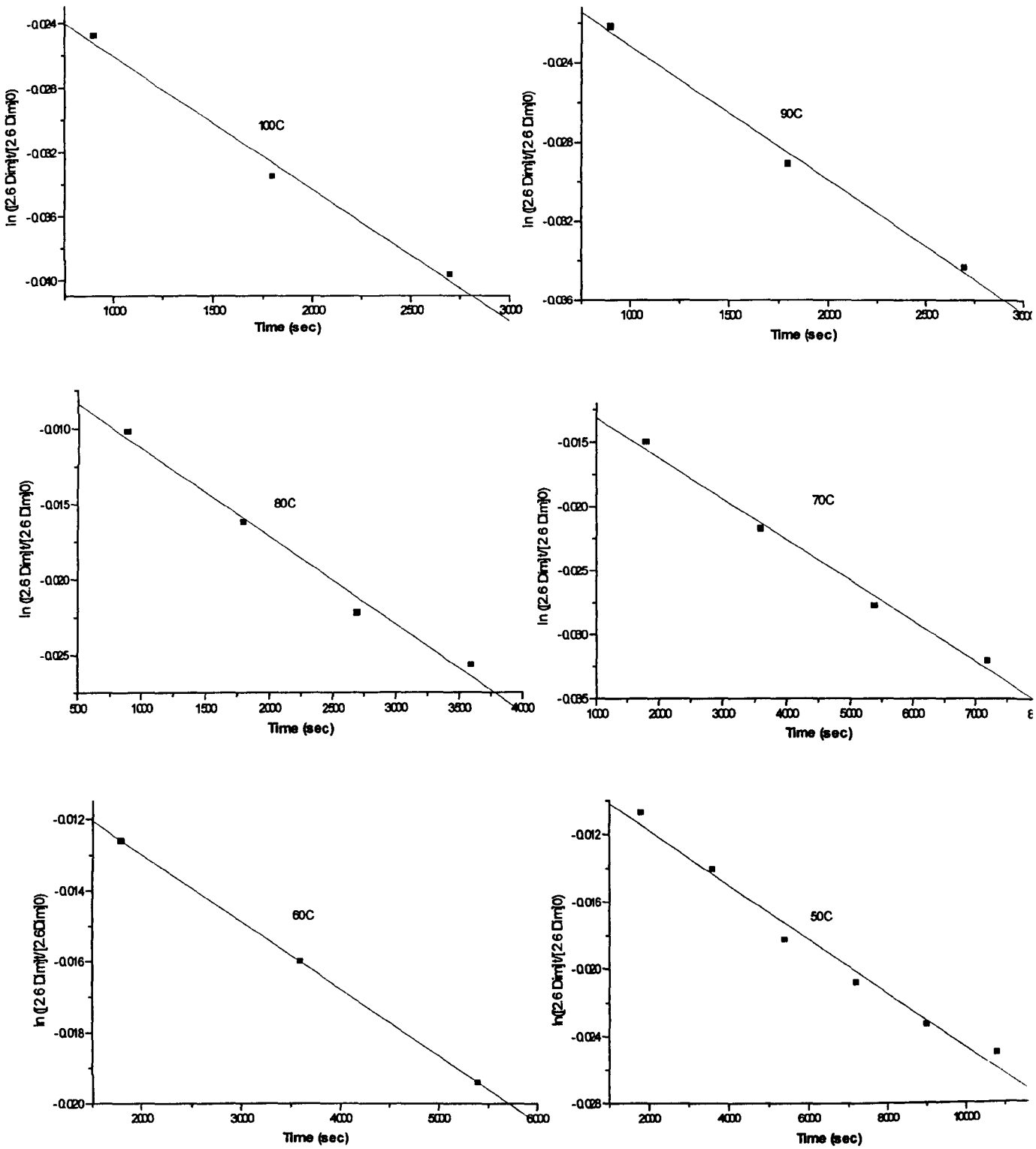


Figure A. 1.32: First order kinetic plot for reaction of 2,6-dimethoxyphenol with propionic anhydride at various temperatures.

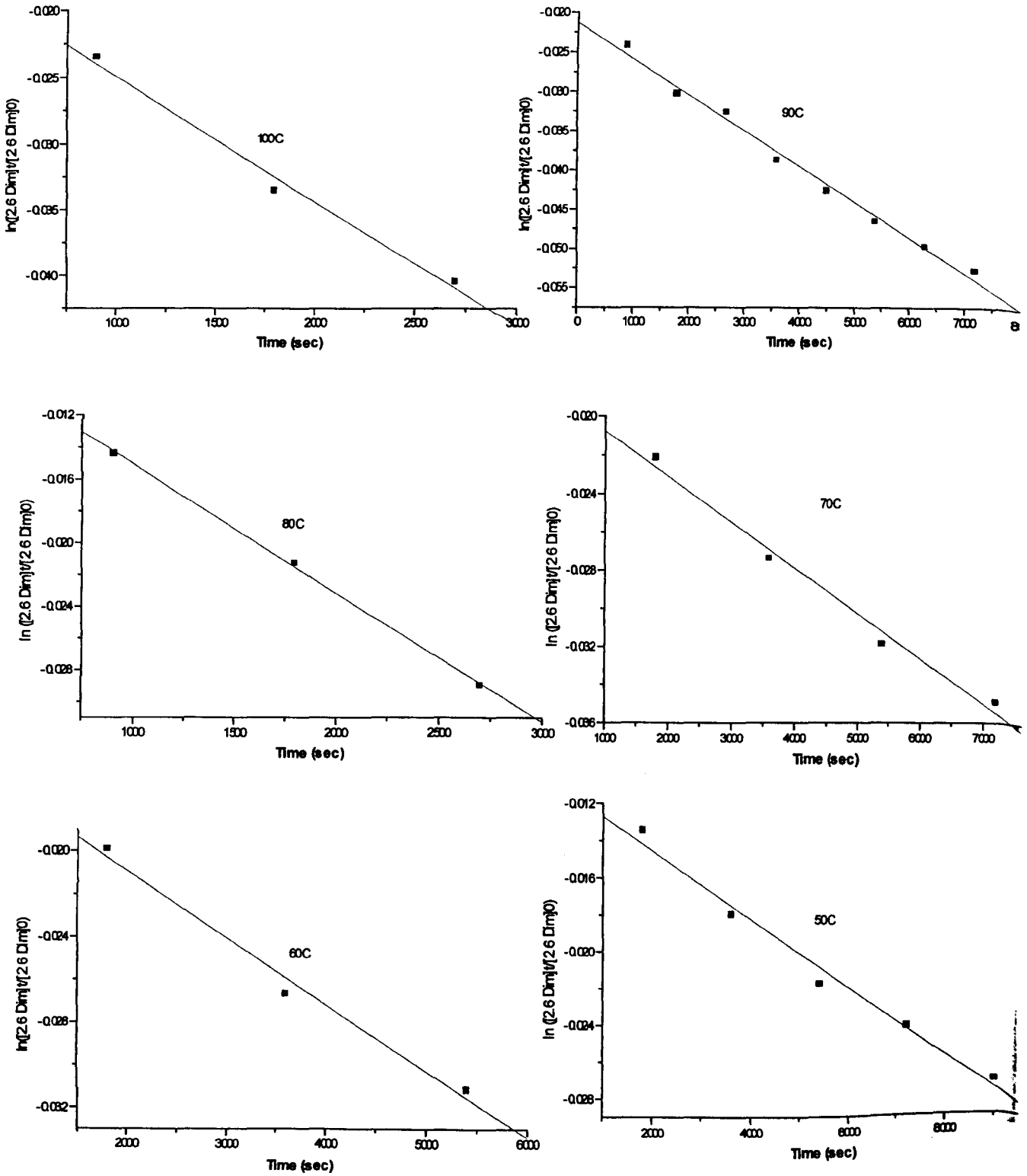


Figure A. 1.33: First order kinetic plot for reaction of 2,6-dimethoxyphenol with butyric anhydride at various temperatures.

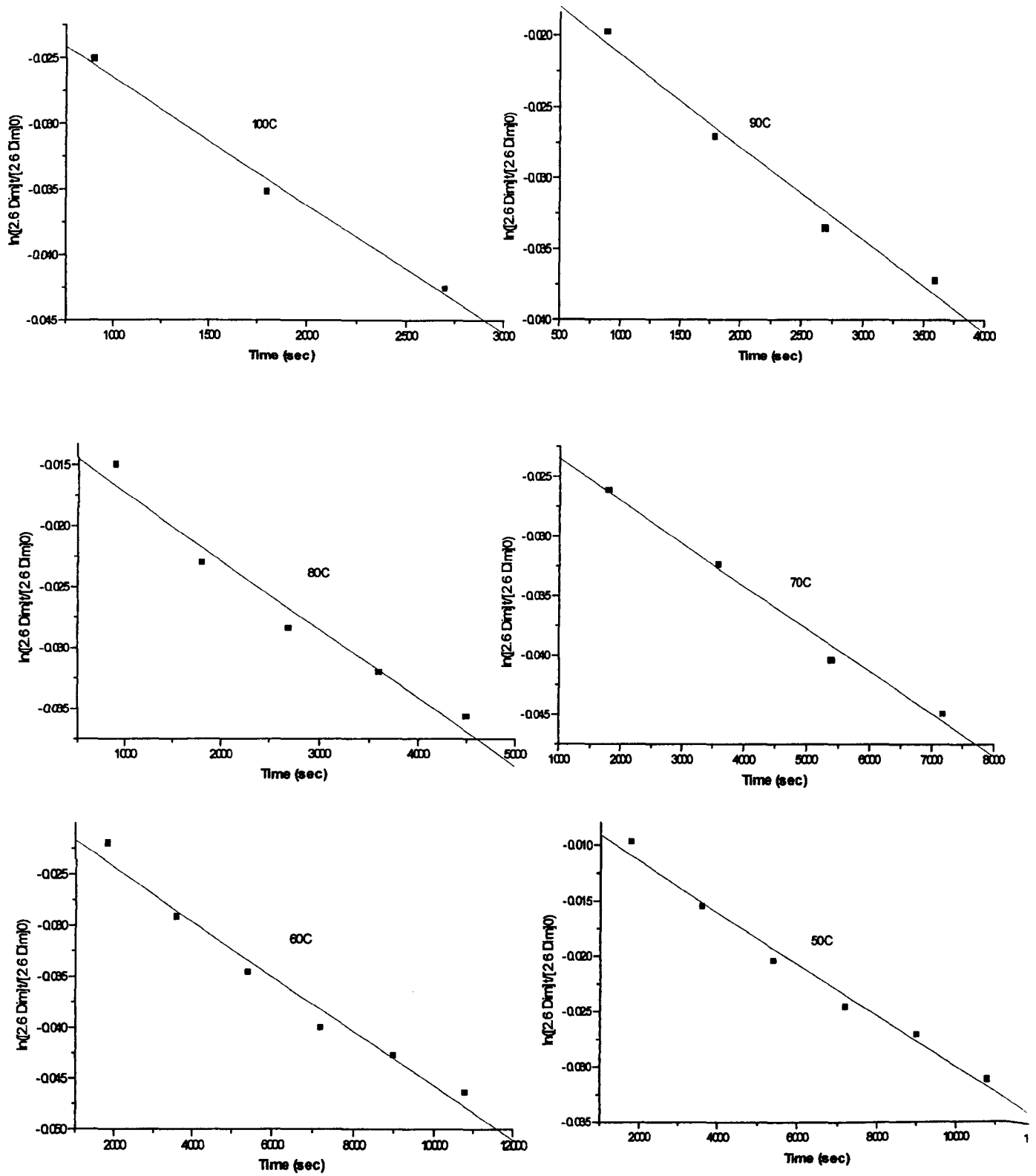


Figure A. 1.34: First order kinetic plot for reaction of 2,6-dimethoxyphenol with valeric anhydride at various temperatures.

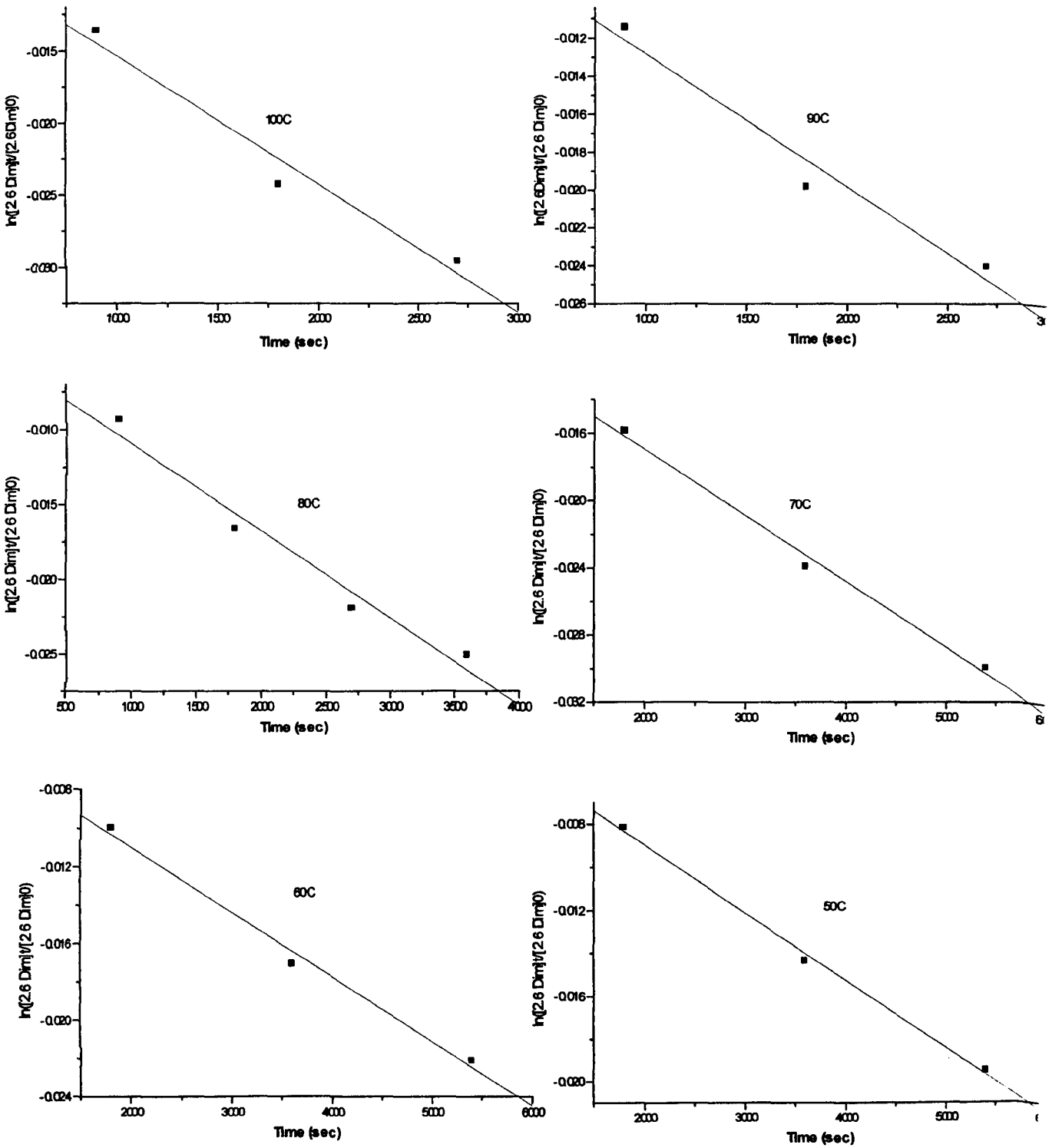


Figure A. 1.35: First order kinetic plot for reaction of 2,6-dimethoxyphenol with hexanoic anhydride at various temperatures.

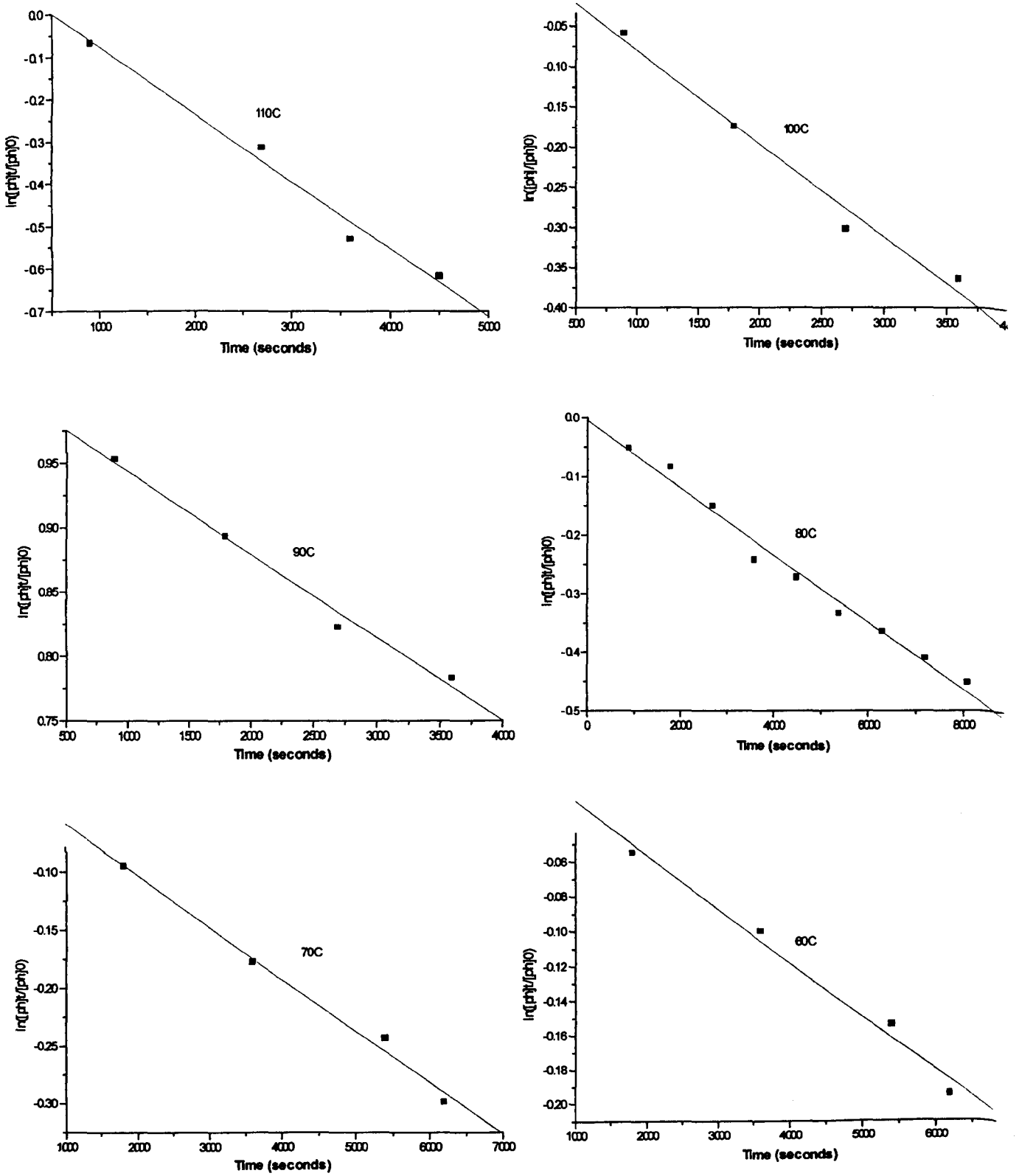


Figure A. 1.36: First order kinetic plot for reaction of 3 methoxyphenol with acetic anhydride at various temperatures.

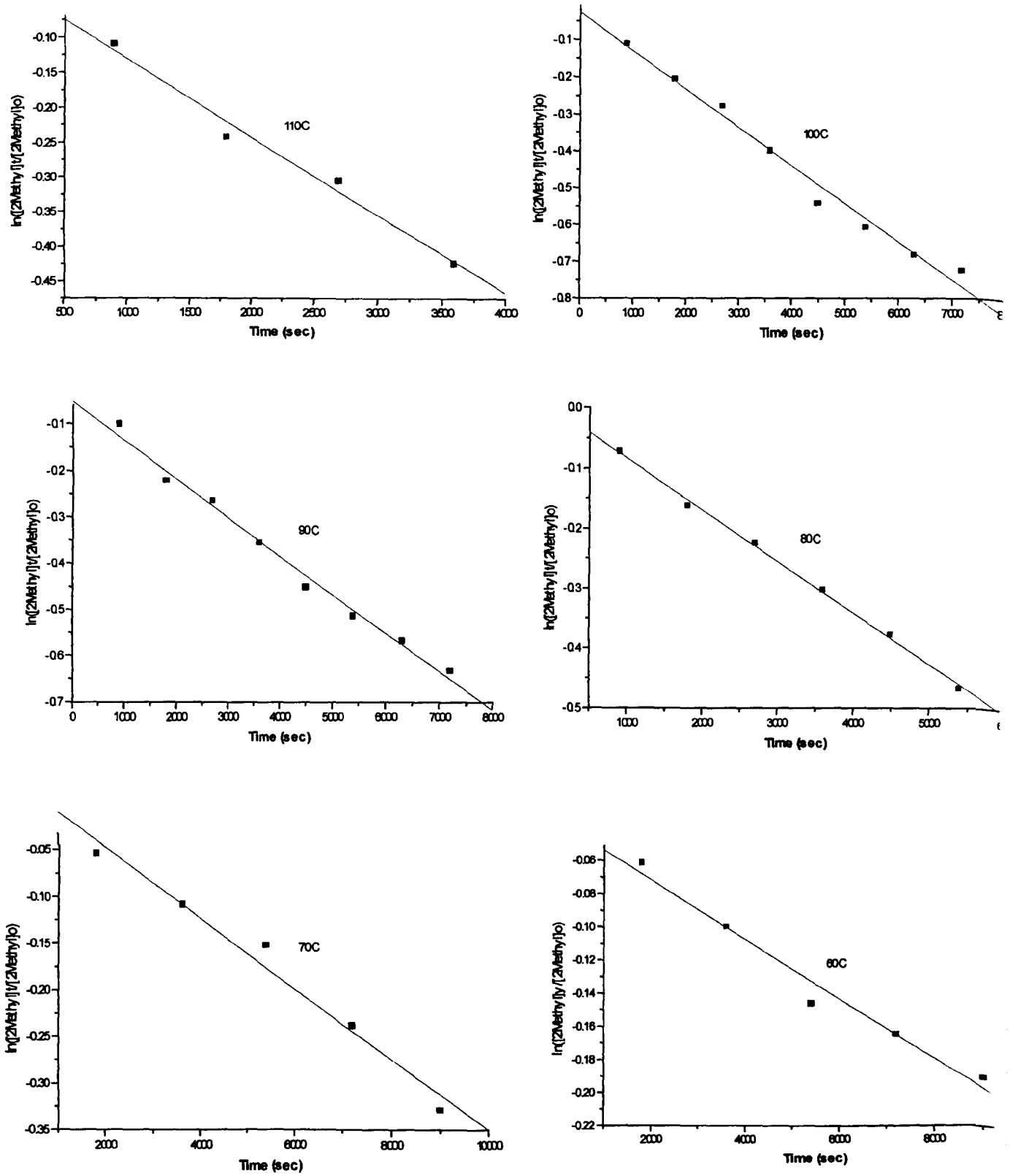


Figure A. 1.37: First order kinetic plot for reaction of 2 methylyphenol with acetic anhydride at various temperatures.

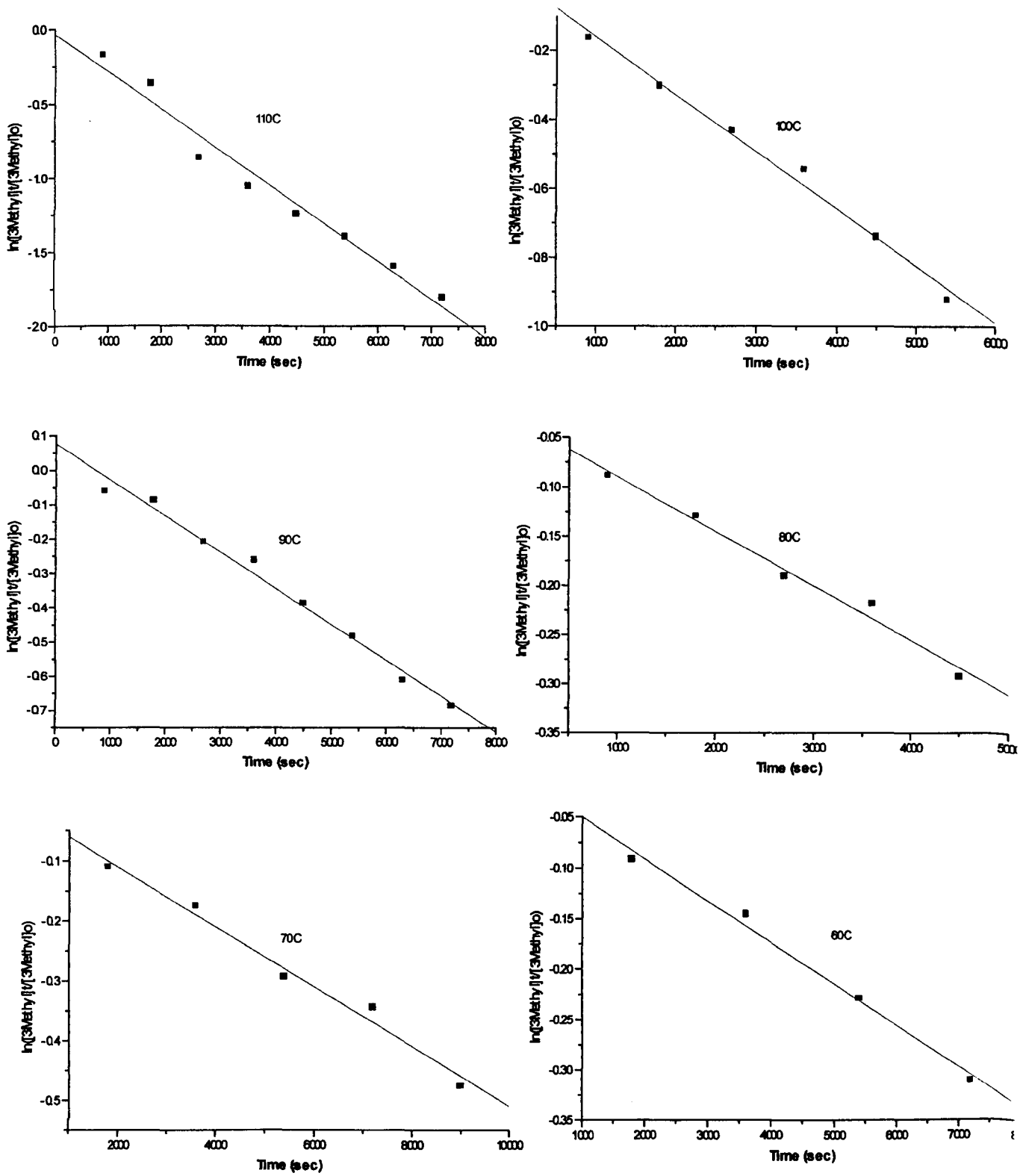


Figure A. 1.38: First order kinetic plot for reaction of 3 methylyphenol with acetic anhydride at various temperatures.

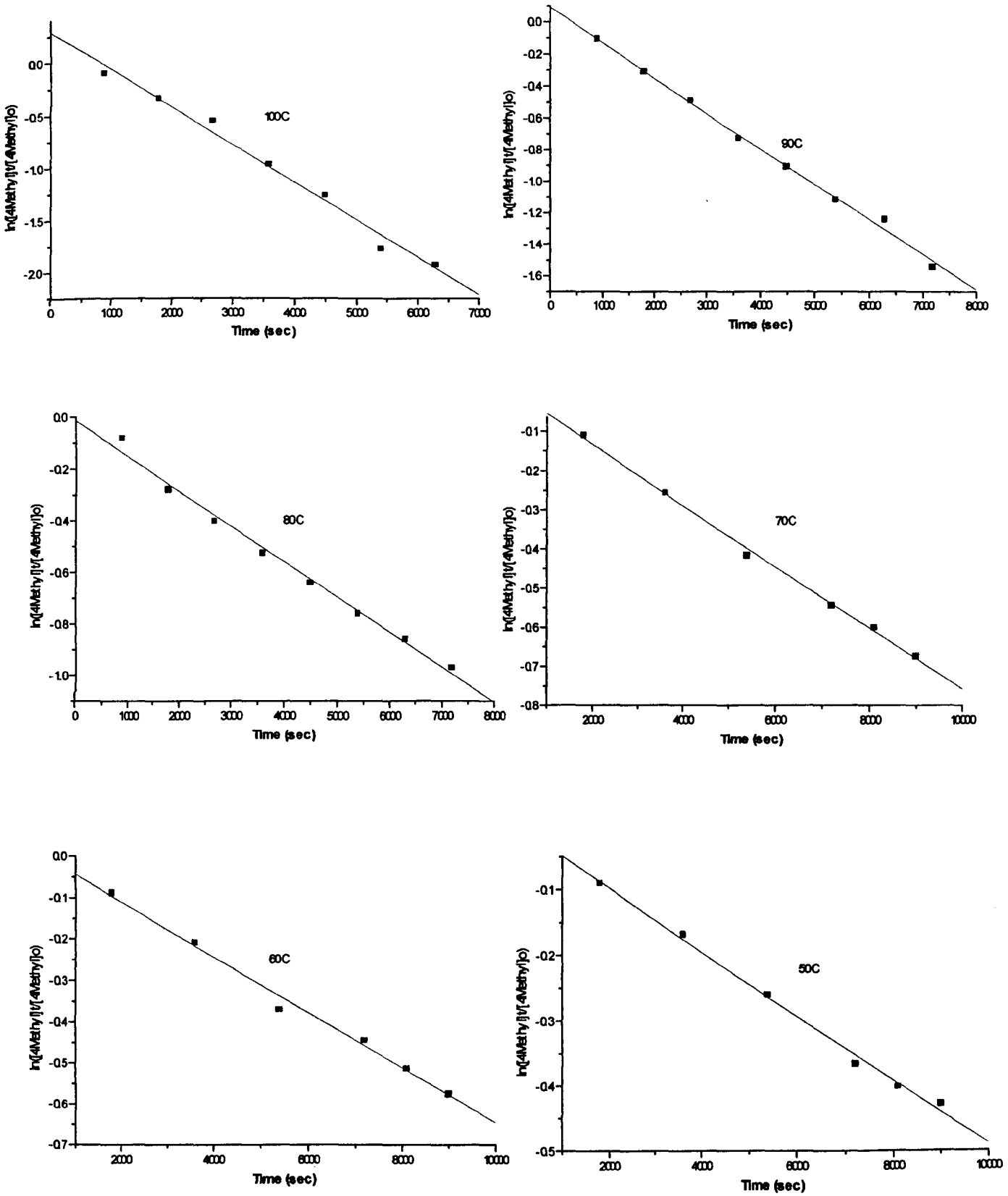


Figure A. 1.39: First order kinetic plot for reaction of 4 methylyphenol with acetic anhydride at various temperatures.

Table A.1 Arrehnius data (from initial rates) for reaction of phenol and guaiacol with butyric and valeric anhydride.

Temperature	Phenol		Guaicaol	
(°C)	Butyric	Valeric	Butyric	Valeric
		ln(Ro)		
100	-8.51719	-8.51719	-7.42776	-7.17221
90	-8.9479	-8.9479	-7.85594	-7.6478
80	-9.4334	-9.4334	-8.01172	-7.79095
70	-9.7211	-9.7211	-8.22982	-8.03157
60	-10.1266	-10.1266	-8.09969	-8.0077
50	-10.4143	-10.4143	-8.28348	-8.1141

Table A..2. Arrehnius data (from initial rates) for reaction of 2,6-dimethoxyphenol with aceric, propionic, butyric, valeric and hexanoic anhydride.

Temperature (°C)	Acetic	Propionic	Butyric	Valeric	Hexanoic
	-		2,6-dimethoxyphenol ln (Ro)		
100	-8.12411	-8.14198	-8.17521	-8.08162	-8.8197
90	-7.88154	-8.34758	-8.3681	-8.54045	-9.02349
80	-8.43904	-9.06712	-8.86524	-8.77174	-8.97574
70	8.80618	-9.17405	-8.5895	-8.81437	-9.43843
60	-8.99167	-9.43585	-8.7519	-8.97756	-9.62346
50	-9.33031	-9.72711	-9.27569	-9.77568	-9.87589

Table A..3: Arrehnius data (from initial rates) for reaction of 2, aceric anhydride with 3methoxy phenol, 2 methylphenol, 3 methylphenol and 4 methylphenol.

Temperature	Acetic			
(°C)	3 Methoxy	2 Methyl	3Methyl	4Methyl
		ln (Ro)		
100	-6.625	-6.43496	-5.42174	-5.95861
90	-6.73483	-6.70568	-6.35827	-6.07994
80	-7.34882	-6.76227	-7.10824	-6.21885
70	-7.57038	-6.91707	-7.29471	-7.14097
60	-7.69577	-8.07534	-7.56338	-7.28621
50	-8.4194	-7.9783	-7.78844	-7.52225

Table A.4 Arrehnius data (from rate constants) for reaction of phenol and guaiacol with butyric and valeric anhydride

Temperature	Phenol		Guaicaol	
(°C)	Butyric	Valeric	Butyric	Valeric
		ln(k)		
100	-5.64199	-5.6355	-9.56701	-9.4334
90	-6.18535	-6.1161	-9.72116	-9.56701
80	-6.54819	-6.6664	-10.12663	-9.90348
70	-6.71255	-6.65068	-10.41431	-10.12663
60	-7.12558	-7.0825	-10.81977	-10.41431
50	-7.34785	-7.59454	-11.51292	-10.81977

Table A..5 Arrehnius data (from initial rates) for reaction of 2,6-dimethoxyphenol with aceric, propionic, butyric, valeric and hexanoic anhydride.

Temperature (°C)	Acetic	Propionic	Butyric	Valeric	Hexanoic
			2,6-dimethoxyphenol		
	-		ln (k)		
100	-11.61313	-11.70524	-11.5693	-11.54374	-11.63414
90	-11.90449	-11.90508	-12.30196	-11.93957	-11.8684
80	-11.78578	-12.05204	-11.72254	-12.09469	-12.0531
70	-13.0091	-12.66421	-12.9492	-12.54308	-12.60071
60	-13.23067	-13.1802	-12.6763	-12.83557	-12.45059
50	-13.2507-	-13.34051	-13.2008	-12.97632	-12.66883

Table A..6: Arrehnius data (from rate constants) for reaction of 2, aceric anhydride with 3methoxy phenol, 2 methylphenol, 3 methylphenol and 4 methylphenol.

Temperature	Acetic			
(°C)	3 Methoxy	2 Methyl	3Methyl	4Methyl
		ln (k)		
100	-8.74034	-9.11503	-8.29405	-7.9294
90	-9.02801	-9.21034	-8.67971	-8.42188
80	-9.56702	-9.43348	-9.21034	-8.87387
70	-9.72212	-9.3157	-9.72116	-9.43348
60	-10.12663	-10.12663	-9.90348	-9.56701
50	-10.41431	-10.81978	-10.12663	-9.90348

APPENDIX 3

Table 3.1: Density (gr/cm^3) of modified Corsican and Scots pine samples at various temperatures. (Standard deviations are shown in parentheses).

Anhydride	Acetic anhydride						
Temperature	120^{0}C	110^{0}C	100^{0}C	90^{0}C	80^{0}C	70^{0}C	60^{0}C
Scots pine	0.402	0.405	0.411	0.408	0.422	0.402	0.405
	(0.033)	(0.022)	(0.031)	(0.029)	(0.03)	(0.042)	(0.04)
Corsican pine	0.472	0.477	0.465	0.455	0.488	0.468	0.472
	(0.019)	(0.035)	(0.028)	(0.032)	(0.031)	(0.022)	(0.021)

Anhydride	Propionic anhydride						
Temperature	120^{0}C	110^{0}C	100^{0}C	90^{0}C	80^{0}C	70^{0}C	60^{0}C
Scots pine	0.422	0.419	0.418	0.422	0.417	0.412	0.415
	(0.023)	(0.012)	(0.021)	(0.022)	(0.033)	(0.032)	(0.022)
Corsican pine	0.468	0.472	0.475	0.459	0.468	0.488	0.482
	(0.021)	(0.034)	(0.038)	(0.029)	(0.026)	(0.028)	(0.031)

Anhydride	Butyric anhydride						
Temperature	120^{0}C	110^{0}C	100^{0}C	90^{0}C	80^{0}C	70^{0}C	60^{0}C
Scots pine	0.422	0.431	0.429	0.438	0.422	0.427	0.43
	(0.019)	(0.023)	(0.033)	(0.039)	(0.013)	(0.022)	(0.034)
Corsican pine	0.425	0.427	0.425	0.435	0.428	0.428	0.422
	(0.029)	(0.025)	(0.038)	(0.033)	(0.039)	(0.042)	(0.041)

Anhydride	Valeric anhydride						
Temperature	120^{0}C	110^{0}C	100^{0}C	90^{0}C	80^{0}C	70^{0}C	60^{0}C
Corsican pine	0.452	0.451	0.439	0.448	0.442	0.447	0.44
	(0.029)	(0.033)	(0.043)	(0.049)	(0.053)	(0.032)	(0.044)
Scots pine	0.445	0.457	0.445	0.455	0.438	0.438	0.442
	(0.024)	(0.055)	(0.048)	(0.023)	(0.029)	(0.042)	(0.031)

Anhydride	Hexanoic anhydride						
Temperature	120^{0}C	110^{0}C	100^{0}C	90^{0}C	80^{0}C	70^{0}C	60^{0}C
Corsican pine	0.462	0.461	0.449	0.448	0.462	0.467	0.45
	(0.021)	(0.053)	(0.043)	(0.039)	(0.03)	(0.04)	(0.054)
Scots pine	0.425	0.437	0.435	0.425	0.428	0.428	0.432
	(0.029)	(0.035)	(0.038)	(0.023)	(0.049)	(0.032)	(0.021)

Table 3.2: Percentage volume increase of Corsican pine samples modified with acetic anhydride at various temperatures.

Reaction Time(sec)	60 °C VC (%)	70 °C VC (%)	80 °C VC (%)	90 °C VC (%)	100 °C VC (%)	110 °C VC (%)	120 °C VC (%)
900	1.2521	1.9955	2.1211	2.9855	3.0211	3.1255	4.1255
1800	2.1455	2.6422	2.9951	3.8855	4.5522	4.8855	4.9855
2700	2.7022	3.882	3.7852	4.2155	4.2255	5.0021	4.3322
3600	4.7752	4.1542	4.0233	5.0021	5.0012	5.5584	5.8855
4500	4.4988	5.1266	3.8855	5.6622	5.502	6.3355	6.3322
5400	5.0012	4.5532	4.5523	5.9999	5.2126	6.8775	6.6685
6300	5.4988	4.9523	5.0021	6.6632	4.9922	7.5522	7.5588
7200	5.203	5.3962	5.5522	5.1226	6.1222	6.9988	6.9952
8100	6.1233	5.7622	5.1566	6.7521	5.3333	8.0012	7.689
9000	5.5542	7.1256	5.9888	7.1268	6.5588	8.4523	8.2333
9900	5.8866	6.3322	6.0012	7.755	7.1256	7.988	8.5899
10800	6.0021	6.0002	6.6633	7.99	7.5893	9.0012	8.2126
12600	5.7012	6.9955	7.1222	7.5562	8.3522	9.3856	7.9952
14400	6.2311	7.4123	7.7452	8.4569	8.6633	9.7755	9.1236
16200	6.5588	6.6521	7.2336	8.8877	8.1255	10.125	9.885
18000	6.8023	7.9955	8.2133	9.4852	9.2211	9.2533	12.11
19800	6.6652	8.123	8.5566	9.3541	9.5522	10.5433	10.85
21600	7.1001	8.6623	7.8666	10.012	9.0012	10.8856	11.25
23400	7.2143	8.4852	8.7755	10.3555	9.6688	11.2333	11.56
25200				10.125		10.769	12.01

Table 3.3: Percentage volume increase of Corsican pine samples modified with propionic anhydride at various temperatures.

Reaction Time(sec)	60°C VC (%)	70°C VC (%)	80°C VC (%)	90°C VC (%)	100°C VC (%)	110°C VC (%)	120°C VC (%)
900	0	0	0	0	0	0	0
1800	1.34	1.55	2.24	2.26	1.99	1.65	1.8
2700	2.12	2.24	3.12	3.22	2.88	2.49	2.62
3600	2.99	3.33	4.42	4.4	3.28	3.31	3.34
4500	3.55	3.88	4.66	4.78	4.45	5.28	5.26
5400	3.99	4.19	5.12	5.09	4.88	5.01	4.94
6300	4.49	5.12	6.01	5.95	6.22	7.22	7.1
7200	4.88	4.66	5.44	6.21	7.55	8.67	8.6
8100	5.16	5.22	6.55	6.66	7.99	8.44	8.12
9000	5.55	5.88	6.98	7.02	8.12	8.86	8.2
9900	5.88	6.12	7.12	7.44	8.38	9.45	9.6
10800	6.12	6.48	7.68	7.77	8.66	9.35	9.5
12600	6.45	6.24	8.01	8	9.18	10.12	10.38
14400	7.01	7.02	8.55	8.49	9.88	10.99	10.46
16200	6.88	7.38	9.01	8.88	10.15	11.55	11.67
18000	7.39	7.88	9.99	9.55	10.55	12.01	11.98
19800	7.66	8.01	9.66	9.88	11.12	11.88	12.51
21600	7.88	7.65	9.88	10.15	11.88	12.45	12.38
23400	8.01	8.55	10.12	10.55	12.55	12.66	12.46
25200	8.23	9.01	10.98	10.88	12.99	13.33	13.3

***Table 3.4**: Percentage volume increase of Corsican pine samples modified with butyric anhydride at various temperatures.*

Reaction Time(sec)	60 °C VC (%)	70 °C VC (%)	80 °C VC (%)	90 °C VC (%)	100 °C VC (%)	110 °C VC (%)	120 °C VC (%)
900	2.02	4.6	6.7	5.51	5.98	5.45	3.49
1800	3.48	5.66	6.35	5.92	5.56	6.42	4.1
2700	4.18	7.01	6.47	6.08	7.16	7.09	4.16
3600	3.43	7.01	7.72	7.18	6.33	7.89	6.45
4500	4.78	6.58	7.94	8.76	7.47	9.27	6.35
5400	5.18	6.56	8.57	8.9	8.42	10.9	7.15
6300	5.79	6.61	8.87	9.19	7.57	10.12	7.1
7200	5.34	7.04	9.62	8.37	8.16	10.41	8.41
8100	5.7	7.59	10	9.17	9.24	10.46	8.99
9000	6.06	7.86	9.28	9.95	9.03	11.15	9.64
9900	6.49	9.65	10.29	9.4	9.75	11.74	9.58
10800	6.27	8.54	11.31	9.63	8.96	13.12	9.62
12600	7	9.59	11	10.48	10.02	11.74	10.05
14400	7.09	9.81	12.08	12.73	11.37	13.36	11.22
16200	7.93	10.93	12.34	11.88	11.16	12.31	13.02
18000	8.62	10.05	12.27	12.37	10.62	14.45	13.48
19800	6.53	10.4	13.26	12.45	11.99	13.69	13.64
21600	7.3	11.13	13.48	13.69	13.14	15.39	14.77
23400	7.78	10.77	13.56		13.56	16.72	14.62
25200					12.13	17.02	16.5

Table 3.5: Percentage volume increase of Corsican pine samples modified with valeric anhydride at various temperatures.

Reaction Time(sec)	60 °C VC (%)	70 °C VC (%)	80 °C VC (%)	90 °C VC (%)	100 °C VC (%)	110 °C VC (%)	120 °C VC (%)
900	2.4	4.09	3	4.34	4.38	4.83	5.06
1800	3.4	4.98	4.18	6.44	6.55	4.95	5.41
2700	3.83	6.7	5.61	8.3	8.19	6.46	7.69
3600	4.61	6.55	5.99	8.16	8.22	7.34	7.45
4500	4.71	5.72	5.9	8.32	8.36	7.72	8.1
5400	5.37	7.07	6.51	8.68	8.72	7.61	9.02
6300	5.92	6.25	7.85	8.34	8.88	7.13	8.68
7200	6.37	7.26	8.08	8.74	8.55	8.43	9.57
8100	7.48	7.5	7.34	11.39	10.99	9.88	9.77
9000	8.69	7.35	8.29	11.56	11.71	8.8	9.12
9900	7.28	8.99	8.53	10.53	12.55	9.57	11.64
10800	8.73	7.06	9.62	10.42	12.99	10.05	11.14
12600	8.51	8.78	10.4	13.81	13.35	10.06	13.81
14400	7.97	9.66	9.44	13.74	14.02	11.39	13.84
16200	10.37	10.01	11.23	15.46	15.12	11.96	13.36
18000	10.35	9.13	12.08	14.41	16.02	12.12	14.44
19800	11.28	9.62	11.39	14.2	16.99	11.71	14.29
21600	10.46	8.95	12.58	14.88	17.88	12.26	17.49
23400	10.77	10.01	12.92		19.01	12.88	
25200			13.1				

Table 3.6: Percentage volume increase of Corsican pine samples modified with hexanoic anhydride at various temperatures.

Reaction	60 °C	70 °C	80 °C	90 °C	100 °C	110 °C	120 °C
Time(sec)	VC (%)	VC (%)	VC (%)	VC (%)	VC (%)	VC (%)	VC (%)
900	3.95	5.6	5.71	5.06	5.04	5.43	3.18
1800	4.63	5.51	6.16	6.06	6.03	4.97	4.81
2700	6.22	6.92	6.42	7.16	6.64	7.31	5.56
3600	5.79	7.02	6.82	7.37	7.73	7.42	5.95
4500	7.76	7.68	6.89	8.01	8.03	7.37	6.83
5400	7.76	7.89	7.01	8.61	9.02	7.28	7.89
6300	8.59	6.61	8.95	8.7	9.76	9.68	8.94
7200	7.74	8.17	8.6	9.2	9.79	10.07	9.46
8100	8.69	8.77	8.82	10.08	10.18	9.82	8.54
9000	10.34	7.93	7.9	9.2	10.3	10.11	8.43
9900	10.42	7.62	8.41	11.68	10.4	9.84	10.46
10800	11.97	9.04	10.23	10.61	11.76	11.67	10.47
12600	12.29	9.41	9	10.07	12.66	10.44	10.72
14400	12.65	9.81	11.24	12.17	12.58	13.92	13.45
16200	13.07	9.08	11.79	11.77	12.63	13.43	13.97
18000	15.69	9.75	11.14	12.85	14.63	13.54	13.37
19800	13.38	10.04	10.41	13	14.84	16.36	15.78
21600	14.01	10.48	11.43	13.23	14.44	17.38	15.12
23400	14.17		11.14		13.57		15.76
25200	13.12						

Table 3.7: Percentage volume increase of Scots pine samples modified with acetic anhydride at various temperatures.

Reaction Time(sec)	60 °C VC (%)	70 °C VC (%)	80 °C VC (%)	90 °C VC (%)	100 °C VC (%)	110 °C VC (%)	120 °C VC (%)
900	1.01	2.11	2.55	3.22	3.55	3.88	4.23
1800	1.98	2.77	3.16	3.98	4.38	5.01	5.12
2700	2.55	4.02	4.12	4.61	5.01	5.55	5.55
3600	5.12	4.22	4.99	5.16	5.55	6.12	6.12
4500	5.26	4.88	5.33	6.12	5.99	6.88	6.55
5400	5.55	5.16	5.99	6.88	6.21	7.16	6.98
6300	6.12	5.66	6.55	6.55	6.55	7.66	7.23
7200	6.55	6.18	7.22	7.16	7.12	6.99	7.66
8100	6.88	6.55	7.01	7.55	6.85	8.12	8.12
9000	7.16	6.99	7.33	7.88	7.88	8.65	8.89
9900	6.75	7.25	8.12	8.35	8.36	9.12	8.65
10800	7.35	7.55	7.55	7.95	8.88	9.49	9.21
12600	7.55	8.25	8.33	8.88	9.33	9.88	9.55
14400	7.88	8.49	8.66	9.21	9.77	10.22	10.66
16200	7.21	8.88	9.15	9.55	10.22	10.79	10.99
18000	8.03	9.15	9.77	10.25	10.69	11.33	11.55
19800	8.15	9.55	10.15	10.88	11.23	11.79	12.22
21600	8.29	9.88	10.35	11.32	11.62	12.05	12.55
234000	8.35	10.16	10.55	11.55	11.89	12.33	12.86

Table 3.8: Percentage volume increase of Scots pine samples modified with propionic anhydride at various temperatures.

Reaction Time(sec)	60 °C VC (%)	70 °C VC (%)	80 °C VC (%)	90 °C VC (%)	100 °C VC (%)	110 °C VC (%)	120 °C VC (%)
900	1.12	1.45	2.55	2.44	2.22	2.22	2.2
1800	1.99	2.12	3.33	3.21	3.12	3.55	3.22
2700	2.45	3.03	4.66	4.55	3.01	4.12	4.44
3600	3.875	3.55	5.22	5.12	4.21	4.88	5.61
4500	4.35	4.55	5.88	5.77	4.89	5.22	5.01
5400	5.55	5.19	5.98	6.01	5.88	6.66	6.88
6300	6.12	4.88	6.66	6.55	6.55	7.77	7.66
7200	5.88	5.88	6.01	6.98	7.13	8.88	9.55
8100	6.33	6.13	7.12	7.16	8.28	9.55	10.23
9000	6.88	6.66	7.88	7.69	8.88	10.15	9.89
9900	7.15	7.13	8.33	8.29	9.13	10.88	11.49
10800	7.88	7.55	7.66	8.88	9.55	11.55	12.55
12600	7.55	7.99	9.19	9.31	10.16	12.22	11.99
14400	8.12	8.23	10.88	9.88	10.66	12.66	13.62
16200	8.23	8.43	9.99	10.18	11.22	13.88	14.55
18000	8.55	9.22	10.16	10.55	12.22	14.55	15.66
19800	8.88	9.55	9.77	10.88	12.66	15.21	16.88
21600	9.15	9.88	10.89	11.22	13.55	15.88	17.22
23400	9.23	9.77	11.55	11.55	13.88	16.21	17.66
25200							

Table 3.9: Percentage volume increase of Scots pine samples modified with butyric anhydride at various temperatures.

Reaction Time(sec)	60 °C VC (%)	70 °C VC (%)	80 °C VC (%)	90 °C VC (%)	100 °C VC (%)	110 °C VC (%)	120 °C VC (%)
900	2.25	3.12	5.99	5.88	4.99	5.12	5.23
1800	3.21	4.85	7.22	6.99	5.66	5.72	5.99
2700	3.88	5.99	7.99	7.69	7.55	7.48	7.21
3600	4.22	6.23	10.77	10.55	9.21	9.32	9.21
4500	5.01	6.95	11.22	11.43	9.88	10.01	10.12
5400	5.68	7.23	10.99	11.88	10.22	10.48	10.66
6300	6.13	7.75	11.55	11.22	11.55	11.23	11.55
7200	6.55	8.26	11.88	10.66	12.21	12.19	12.23
8100	7.22	8.87	12.55	12.69	12.88	13.01	13.14
9000	7.88	9.12	13.21	13.22	13.19	13.2	13.55
9900	8.88	9.45	13.66	13.79	13.66	13.88	14.01
10800	8.35	8.55	14.16	14.19	14.55	14.66	14.69
12600	9.22	10.13	14.77	14.88	14.99	15.02	15.11
14400	9.55	9.87	15.23	15.31	15.21	15.51	15.68
16200	9.73	10.45	15.88	15.01	16.01	16.03	16.08
18000	9.45	10.79	16.22	15.99	16.69	16.88	16.99
19800	9.89	11.23	16.55	16.47	17.55	17.69	17.55
21600	10.12	11.55	16.99	16.87	18.21	18.31	18.55
23400	10.23	11.88	17.23	17.01	18.68	18.73	19.21

Table 3.10: Percentage volume increase of Scots pine samples modified with valeric anhydride at various temperatures.

Reaction Time(sec)	60 °C VC (%)	70 °C VC (%)	80 °C VC (%)	90 °C VC (%)	100 °C VC (%)	110 °C VC (%)	120 °C VC (%)
900	1.9	2.68	2.12	2.55	2.44	2.99	3.88
1800	2.5	3.52	3.25	3.65	3.22	3.55	4.45
2700	3.1	4.22	3.99	4.12	3.88	4.21	5.31
3600	3.5	5.55	4.14	4.66	4.22	4.88	5.99
4500	4.2	6.23	4.99	5.12	4.88	5.99	6.33
5400	4.4	6.88	5.21	5.55	5.55	5.55	6.77
6300	5.48	7.12	5.55	5.99	5.01	6.88	7.55
7200	6.12	7.55	5.88	6.55	6.68	6.55	8.23
8100	6.21	7.88	6.55	6.12	7.45	7.55	9.11
9000	6.88	8.01	6.12	7.21	7.99	8.21	9.99
9900	7.55	7.66	6.66	7.77	8.31	8.88	10.31
10800	7.99	8.22	7.77	8.55	8.88	9.88	10.99
12600	8.23	8.47	8.12	9.01	9.66	9.51	10.66
14400	7.85	8.88	8.88	9.55	10.55	10.66	11.66
16200	8.68	8.58	8.55	10.23	11.21	11.21	12.44
18000	9.16	9.21	9.21	10.66	11.88	11.99	12.99
19800	9.55	9.41	9.66	11.21	12.35	12.55	13.55
21600	9.99	9.55	10.12	11.77	12.88	13.21	14.21
23400	10.12	9.21	10.55		13.55	13.88	14.55
25200					13.99	14.55	

Table 3.11: Percentage volume increase of Scots pine samples modified with hexanoic anhydride at various temperatures.

Reaction	60 °C	70 °C	80 °C	90 °C	100 °C	110 °C	120 °C
Time(sec)	VC (%)	VC (%)	VC (%)	VC (%)	VC (%)	VC (%)	VC (%)
900	1.99	3.55	2.55	4.33	4.49	4.55	4.39
1800	2.33	4.23	3.88	5.55	5.31	5.33	5.21
2700	3.01	4.83	4.55	6.33	6.29	5.99	6.12
3600	3.95	5.55	5.21	7.12	7.01	6.45	6.59
4500	4.24	5.02	6.67	7.99	8.11	6.99	7.01
5400	4.78	6.01	7.23	8.58	8.99	7.99	7.46
6300	5.21	6.22	7.88	9.55	9.23	7.36	8.01
7200	5.88	6.88	8.21	8.99	9.55	8.21	8.19
8100	5.55	7.55	9.12	9.21	10.22	8.88	8.88
9000	6.31	8.88	8.55	10.02	9.99	9.55	9.49
9900	6.79	7.99	8.88	10.88	10.55	10.02	10.12
10800	7.35	8.21	9.55	11.55	10.88	11.66	12.25
12600	7.01	8.79	9.99	11.11	11.22	12.19	11.88
14400	7.89	9.33	10.11	12.12	11.88	12.88	12.88
16200	8.23	9.88	10.55	12.68	12.36	13.35	13.45
18000	8.88	10.11	10.99	13.11	12.88	14.25	13.99
19800	9.21	10.39	11.55	13.55	13.55	14.88	14.55
21600	9.79	10.77	11.99	14.29	13.99	15.21	15.11
23400	10.12	11.01	12.21	14.66	14.55	15.88	15.86
25200	10.23						

Table 3.12: The ratio of theoretical to measured volume increase V(rel) of Corsican pine samples modified with acetic anhydride at various temperatures.

Reaction	60 °C	70 °C	80 °C	90 °C	100 °C	110 °C	120 °C
Time(sec)	V (rel)	V (rel)	V (rel)	V (rel)	V (rel)	V (rel)	V (rel)
900	0.482132	0.518694	0.524595	0.5294	0.585186	0.610519	0.629241
1800	0.499624	0.616665	0.63011	0.663097	0.694166	0.677772	0.68262
2700	0.532146	0.65958	0.671451	0.681599	0.640036	0.729973	0.648429
3600	0.719984	0.692994	0.674098	0.692877	0.698538	0.722901	0.686272
4500	0.717216	0.70611	0.681599	0.705988	0.712732	0.784236	0.690313
5400	0.728548	0.711743	0.732972	0.791039	0.715964	0.796103	0.79226
6300	0.793026	0.71584	0.725713	0.780953	0.717216	0.819143	0.801545
7200	0.784236	0.743058	0.745894	0.801232	0.758298	0.828236	0.806586
8100	0.802799	0.784236	0.771121	0.818817	0.715964	0.835486	0.815076
9000	0.791039	0.791039	0.784236	0.821603	0.787396	0.843384	0.832098
9900	0.789213	0.801232	0.818817	0.86108	0.826401	0.85214	0.837703
10800	0.788758	0.817186	0.817186	0.863072	0.818817	0.898797	0.843384
12600	0.785738	0.828236	0.833619	0.85108	0.824906	0.891766	0.852849
14400	0.817186	0.837191	0.85108	0.855159	0.833789	0.894487	0.882371
16200	0.820454	0.853026	0.857124	0.869288	0.853381	0.885417	0.8881
18000	0.828236	0.839588	0.889833	0.8881	0.857661	0.918717	0.949759
19800	0.837361	0.85108	0.877841	0.891766	0.890605	0.921192	0.932495
21600	0.840104	0.872244	0.863072	0.884082	0.888292	0.915642	0.935257
23400	0.85108	0.870948	0.873358	0.881992	0.889254	0.922227	0.93017
25200				0.875407		0.923472	0.942344

Table 3.13: The ratio of theoretical to measured volume increase V(rel) of Corsican pine samples modified with propionic anhydride at various temperatures.

Reaction Time(sec)	60 °C V (rel)	70 °C V (rel)	80 °C V (rel)	90 °C V (rel)	100 °C V (rel)	110 °C V (rel)	120 °C V (rel)
900	0.693655	0.727803	0.707009	0.724784	0.709934	0.708921	0.646229
1800	0.719628	0.737013	0.737862	0.76722	0.755359	0.747621	0.70193
2700	0.726794	0.747234	0.746557	0.820968	0.773374	0.78391	0.766404
3600	0.746557	0.775997	0.766608	0.823548	0.820956	0.815972	0.820968
4500	0.775684	0.8198	0.820968	0.828994	0.832814	0.831745	0.832947
5400	0.812179	0.823548	0.822021	0.843796	0.843796	0.864935	0.857602
6300	0.815972	0.832826	0.828994	0.835481	0.859904	0.872131	0.870551
7200	0.8198	0.837058	0.837058	0.859007	0.84939	0.875176	0.871999
8100	0.82508	0.847641	0.847143	0.86209	0.87332	0.883896	0.875176
9000	0.828994	0.853539	0.84939	0.870551	0.876506	0.889762	0.873452
9900	0.837058	0.852026	0.846149	0.859007	0.879716	0.897798	0.879581
10800	0.845032	0.861832	0.859007	0.879581	0.887024	0.907263	0.886888
12600	0.848015	0.870945	0.870551	0.886888	0.890037	0.911999	0.897658
14400	0.853539	0.875176	0.873717	0.893208	0.897937	0.91693	0.914893
16200	0.860417	0.881329	0.886888	0.886888	0.900743	0.921768	0.913444
18000	0.863381	0.882949	0.890037	0.897658	0.904133	0.943334	0.91693
19800	0.870551	0.888665	0.895984	0.901025	0.912143	0.940104	0.927849
21600	0.867668	0.893208	0.899198	0.907263	0.915474	0.949861	0.93371
23400	0.864676	0.900743	0.902576	0.913444	0.921768	0.943025	0.936744
25200					0.929645	0.947053	0.931748

***Table 3.14**: The ratio of theoretical to measured volume increase V(rel) of Corsican pine samples modified with butyric anhydride at various temperatures.*

Reaction	60 °C	70 °C	80 °C	90 °C	100 °C	110 °C	120 °C
Time(sec)	V (rel)	V (rel)	V (rel)	V (rel)	V (rel)	V (rel)	V (rel)
900	0.630936	0.703561	0.714228	0.696275	0.702826	0.730669	0.689781
1800	0.671006	0.738844	0.76776	0.738697	0.777363	0.778591	0.741958
2700	0.683407	0.768638	0.771364	0.768638	0.78487	0.819755	0.777527
3600	0.696406	0.773138	0.773138	0.784954	0.820756	0.825889	0.793374
4500	0.706653	0.782214	0.784954	0.802935	0.824875	0.832114	0.819665
5400	0.716512	0.786707	0.793374	0.819755	0.839291	0.83834	0.830899
6300	0.722743	0.801022	0.799118	0.824875	0.847952	0.868463	0.844755
7200	0.727578	0.821668	0.820301	0.83834	0.85127	0.873283	0.864504
8100	0.752986	0.825889	0.83834	0.847952	0.857886	0.880561	0.877011
9000	0.766011	0.828758	0.844755	0.85127	0.86775	0.888709	0.885198
9900	0.775814	0.835216	0.849998	0.860081	0.869996	0.890957	0.891172
10800	0.784954	0.83834	0.863394	0.866733	0.872356	0.895922	0.895922
12600	0.794226	0.844755	0.868871	0.878052	0.889778	0.900394	0.903253
14400	0.799118	0.849998	0.877011	0.888709	0.894838	0.903253	0.90713
16200	0.819755	0.854516	0.888709	0.899408	0.900394	0.89908	0.900394
18000	0.825889	0.859881	0.895922	0.911378	0.906908	0.892354	0.898862
19800	0.829967	0.8792	0.901821	0.898316	0.910593	0.906463	0.909361
21600	0.832114	0.888709	0.905686	0.913291	0.902041	0.912953	0.900394
23400	0.838055	0.899518	0.916915		0.899518	0.929709	0.90713
25200					0.898862	0.920681	#DIV/0!

***Table 3.15**: The ratio of theoretical to measured volume increase V(rel) of Corsican pine samples modified with valeric anhydride at various temperatures.*

Reaction Time(sec)	60 °C V (rel)	70 °C V (rel)	80 °C V (rel)	90 °C V (rel)	100 °C V (rel)	110 °C V (rel)	120 °C V (rel)
900	0.743937	0.784739	0.764892	0.791679	0.804999	0.785899	0.778725
1800	0.755687	0.820409	0.785967	0.843364	0.858497	0.821229	0.849226
2700	0.752292	0.833415	0.791817	0.867641	0.868558	0.859395	0.876131
3600	0.784059	0.842736	0.793346	0.88177	0.892122	0.863993	0.886351
4500	0.791609	0.850424	0.791679	0.893533	0.911364	0.870481	0.894417
5400	0.843286	0.852187	0.801077	0.90236	0.91756	0.877833	0.908617
6300	0.850424	0.855816	0.851384	0.908343	0.923841	0.88479	0.920643
7200	0.859395	0.864902	0.858742	0.920549	0.930112	0.887569	0.922615
8100	0.867641	0.876047	0.862839	0.926966	0.929826	0.893533	0.926966
9000	0.870481	0.879626	0.867641	0.932126	0.932318	0.899309	0.929061
9900	0.874183	0.88177	0.876131	0.930017	0.935598	0.904346	0.928012
10800	0.88177	0.887569	0.88479	0.936567	0.929061	0.909714	0.931166
12600	0.893445	0.893533	0.88949	0.933377	0.923841	0.911364	0.932126
14400	0.911364	0.899309	0.911364	0.921299	0.918026	0.914498	0.921206
16200	0.914775	0.904165	0.91459	0.920643	0.913297	0.920737	0.918399
18000	0.920643	0.906522	0.919706	0.914498	0.91118	0.930112	0.912652
19800	0.926966	0.911456	0.926966	0.911088	0.905614	0.926966	0.913297
21600	0.930304	0.913297	0.93107	0.908343	0.90245	0.922615	0.908343
23400	0.926396	0.91756	0.935598		0.883666	0.931166	
25200			0.939584				

***Table 3.16**: The ratio of theoretical to measured volume increase V(rel) of Corsican pine samples modified with hexanoic anhydride at various temperatures.*

Reaction Time(sec)	60 °C V (rel)	70 °C V (rel)	80 °C V (rel)	90 °C V (rel)	100 °C V (rel)	110 °C V (rel)	120 °C V (rel)
900	0.753907	0.768604	0.773912	0.79264	0.798587	0.793113	0.752042
1800	0.83426	0.802803	0.843515	0.847545	0.852295	0.843515	0.791462
2700	0.843515	0.841515	0.856409	0.868993	0.868993	0.870414	0.821703
3600	0.848896	0.849574	0.861956	0.856409	0.883416	0.885621	0.852295
4500	0.854347	0.856202	0.868284	0.881222	0.886358	0.890808	0.861259
5400	0.875424	0.864055	0.874705	0.885621	0.890808	0.8938	0.87759
6300	0.883416	0.86687	0.886358	0.888578	0.890808	0.896057	0.883416
7200	0.888578	0.876145	0.890808	0.892302	0.900606	0.907516	0.890064
8100	0.890064	0.879039	0.8938	0.899085	0.90829	0.913748	0.899845
9000	0.896057	0.882683	0.900606	0.905971	0.913748	0.920862	0.90829
9900	0.899845	0.890064	0.890808	0.911401	0.924059	0.921659	0.916107
10800	0.905971	0.884885	0.888578	0.916896	0.927279	0.924059	0.919271
12600	0.909066	0.892302	0.899845	0.923258	0.932151	0.919271	0.924862
14400	0.923258	0.896057	0.910621	0.924862	0.924862	0.916107	0.916107
16200	0.924862	0.901368	0.907516	0.927279	0.923258	0.913748	0.919271
18000	0.915319	0.905201	0.909066	0.923258	0.927279	0.918478	0.906743
19800	0.919271	0.909066	0.910621	0.919271	0.919271	0.909066	0.903664
21600	0.913748	0.911401	0.903664	0.929708	0.916107	0.907516	0.907516
23400	0.90829	0.924059	0.901368		0.911401		
25200							

***Table 3.17**: The ratio of theoretical to measured volume increase V(rel) of Scots pine samples modified with acetic anhydride at various temperatures.*

Reaction Time(sec)	60 °C V (rel)	70 °C V (rel)	80 °C V (rel)	90 °C V (rel)	100 °C V (rel)	110 °C V (rel)	120 °C V (rel)
900	0.61	0.7	0.75	0.63	0.88	0.87	0.82
1800	0.68	0.75	0.78	0.72	0.95	0.95	0.95
2700	0.72	0.82	0.81	0.69	0.99	0.97	0.96
3600	0.85	0.78	0.88	0.9	1	0.99	0.97
4500	0.88	0.86	0.92	0.88	0.99	0.98	0.99
5400	0.92	0.95	0.9	0.91	1.03	1	1.01
6300	0.87	0.99	0.99	0.95	1.05	0.99	1
7200	0.95	1	1.02	0.99	0.99	0.98	1.01
8100	1.01	0.95	1.04	1.03	0.98	1.01	0.99
9000	0.98	1.05	1	0.99	1.15	1.03	0.98
9900	0.86	1.03	0.99	0.96	1.17	1.05	0.99
10800	1.05	1.06	0.88	1.1	1.02	1	1
12600	0.95	0.99	1.01	1.15	1.06	0.99	1.01
14400	0.88	1	1.05	1.05	1.01	0.98	1.03
16200	0.97	0.98	0.99	0.99	0.99	1	1
18000	0.99	1.05	1.01	1.06	1.06	1.01	1.04
19800	1.01	1.07	1.02	1.09	1.17	1.01	1
21600	1.03	1.04	0.98	1.1	1.12	1.03	1.01
23400	1.05	0.99	1.04	1.08	1.1	1	0.99
25200	1.01	1.06	1.03	1.05	1.05	0.99	1.01

Table 3.18: The ratio of theoretical to measured volume increase V(rel) of Scots pine samples modified with propionic anhydride at various temperatures.

Reaction Time(sec)	60 °C V (rel)	70 °C V (rel)	80 °C V (rel)	90 °C V (rel)	100 °C V (rel)	110 °C V (rel)	120 °C V (rel)
900	0.83	0.87	0.85	0.86	0.93	0.93	0.82
1800	0.86	0.88	0.89	0.91	0.95	0.95	0.95
2700	0.87	0.89	0.89	0.96	0.99	0.94	0.97
3600	0.9	0.92	0.93	0.98	1.01	0.98	0.99
4500	0.93	0.96	0.96	0.99	1	1	1
5400	0.96	0.98	0.98	1.02	1.02	1.01	1.01
6300	0.98	0.99	0.99	1	0.99	0.99	1.01
7200	0.97	1.05	1	1.04	1.07	0.98	0.99
8100	0.99	1.02	0.99	1.05	1.04	0.95	0.99
9000	0.99	1.03	1.03	1.07	1.02	1	0.98
9900	1	0.99	1.06	1.04	1	0.98	0.97
10800	1.01	1	1.05	1.03	1.01	0.99	1
12600	0.99	1.04	1.02	1	1.02	1.01	1.01
14400	1.02	1.03	1.01	1.01	1.11	1.01	1.02
16200	1.03	1.07	1	1	1.01	1	0.99
18000	1.02	1.06	1.01	0.99	1	0.99	0.98
19800	1.04	1.05	0.99	0.98	0.99	0.98	1.01
21600	1.03	1.08	1	1	1.01	1	1
23400	1.04	1.07	1.01	1.01	0.99	1.01	1.01
25200							

Table 3.19: The ratio of theoretical to measured volume increase V(rel) of Scots pine samples modified with butyric anhydride at various temperatures.

Reaction Time(sec)	60 °C V (rel)	70 °C V (rel)	80 °C V (rel)	90 °C V (rel)	100 °C V (rel)	110 °C V (rel)	120 °C V (rel)
900	0.75	0.84	0.84	0.82	0.8	1.05	0.78
1800	0.8	0.89	0.91	0.87	0.88	1.02	0.92
2700	0.83	0.9	0.9	0.93	0.92	0.99	0.95
3600	0.81	0.93	0.92	0.88	0.95	1.1	1.01
4500	0.85	0.96	0.95	0.97	1.01	1.01	1.02
5400	0.84	0.97	0.97	0.99	1.19	1	0.99
6300	0.87	1.02	1.13	1.19	1	0.99	0.98
7200	0.87	0.99	1	1	0.98	1.21	1
8100	0.89	1.02	0.99	1.09	0.97	1	1.12
9000	0.92	1.01	1.04	1.05	1.05	1.03	1.15
9900	0.94	1.03	1.05	1.04	1.07	1.05	0.98
10800	0.97	1.1	1.03	1.02	1.05	1.03	1
12600	1.01	1.05	1.02	1	1.03	1.01	1.02
14400	0.98	1.04	1	0.99	1	1.19	1.01
16200	1	0.99	1.03	0.99	1.01	1.02	1.02
18000	0.99	1	1.01	1	0.99	1	1
19800	1.02	1.05	1	1.02	1	1.02	1.03
21600	1	1.03	1.02	1.03	1.01	1.01	1.02
23400	1.01	1.04	1.02	1.02	1	1	1.01
25200							

Table 3.20: The ratio of theoretical to measured volume increase V(rel) of Scots pine samples modified with valeric anhydride at various temperatures.

Reaction Time(sec)	60 °C V (rel)	70 °C V (rel)	80 °C V (rel)	90 °C V (rel)	100 °C V (rel)	110 °C V (rel)	120 °C V (rel)
900	0.84	0.85	0.84	0.84	0.86	0.85	0.82
1800	0.86	0.94	0.92	0.89	0.93	0.94	0.89
2700	0.88	0.96	0.92	0.92	0.95	0.99	0.95
3600	0.93	0.92	0.88	0.93	0.99	1	0.97
4500	0.9	0.98	0.97	0.83	1	1.01	0.98
5400	0.96	1.01	0.93	0.96	1.01	1	1
6300	0.98	0.99	0.88	0.95	1.02	0.98	1.01
7200	1.23	1.2	0.95	0.99	1.01	0.99	0.99
8100	1.03	1.04	0.98	1.18	0.99	1.02	1
9000	1	1.03	1.11	0.98	1.21	1.01	1.01
9900	0.99	1.04	1.01	1	1.01	0.99	0.99
10800	1.05	0.99	1.02	0.98	0.98	0.99	0.99
12600	1.04	1.02	1	0.99	0.99	1	1
14400	1.03	1.28	0.99	1.01	1.05	0.99	1.02
16200	1.05	1	1	1.02	1.02	0.99	1.01
18000	0.91	0.99	1.01	1.04	1.01	1	0.99
19800	0.99	1	1.02	1.02	1	0.99	0.99
21600	1	1.02	1.01	1	0.99	1	1
23400	1.01	1.01	0.99	1.01	1	1.01	0.99
25200							

Table 3.21: The ratio of theoretical to measured volume increase V(rel) of Scots pine samples modified with hexanoic anhydride at various temperatures.

Reaction Time(sec)	60 °C V (rel)	70 °C V (rel)	80 °C V (rel)	90 °C V (rel)	100 °C V (rel)	110 °C V (rel)	120 °C V (rel)
900	0.88	0.87	0.89	0.92	0.92	0.87	0.83
1800	0.98	0.94	0.99	0.99	1	0.99	0.93
2700	0.96	0.97	1	1	1.01	1.01	0.96
3600	1.01	0.95	1.01	0.98	1.04	1.03	1
4500	0.99	0.99	0.98	0.97	1.06	0.98	1.01
5400	1.01	1	1.03	1.05	1	0.97	1
6300	1.04	1.01	1.06	1.04	0.98	1.03	0.98
7200	1.05	1.04	1.21	1.03	1.08	1.04	0.98
8100	1.11	1.03	1.18	1.06	1.07	1.14	0.99
9000	1.05	1.22	1.05	1.18	1.11	0.99	1.01
9900	1.02	1.07	1.08	1.15	1.31	1.06	1
10800	1.25	1.05	1.1	1.08	1.07	1.04	0.99
12600	1.05	1.02	0.95	1.02	1.04	1.21	0.99
14400	1.04	1	0.98	1.02	1	1.05	0.99
16200	1.02	0.99	0.99	0.99	0.99	1.02	0.98
18000	1	0.99	1	0.99	1	1	1
19800	0.99	1	1	1	0.98	0.99	0.99
21600	1	1.01	1.02	0.98	0.99	1.01	0.99
23400	1.01	1	1	0.99	1.01	0.99	0.99
25200							

Table 3.22: The molar volume of Corsican pine samples modified with acetic anhydride at various temperatures.

Reaction Time(sec)	60 °C MOL.VOL	70 °C MOL.VOL	80 °C MOL.VOL	90 °C MOL.VOL	100 °C MOL.VOL	110 °C MOL.VOL	120 °C MOL.VOL
900	85.12	79.12	78.23	77.52	70.13	67.22	65.22
1800	82.14	66.55	65.13	61.89	59.12	60.55	60.12
2700	77.12	62.22	61.12	60.21	64.12	56.22	63.29
3600	57	59.22	60.88	59.23	58.75	56.77	59.8
4500	57.22	58.12	60.21	58.13	57.58	52.33	59.45
5400	56.33	57.66	55.99	51.88	57.32	51.55	51.8
6300	51.75	57.33	56.55	52.55	57.22	50.1	51.2
7200	52.33	55.23	55.02	51.22	54.12	49.55	50.88
8100	51.12	52.33	53.22	50.12	57.32	49.12	50.35
9000	51.88	51.88	52.33	49.95	52.12	48.66	49.32
9900	52	51.22	50.12	47.66	49.66	48.16	48.99
10800	52.03	50.22	50.22	47.55	50.12	45.66	48.66
12600	52.23	49.55	49.23	48.22	49.75	46.02	48.12
14400	50.22	49.02	48.22	47.99	49.22	45.88	46.51
16200	50.02	48.11	47.88	47.21	48.09	46.35	46.21
18000	49.55	48.88	46.12	46.21	47.85	44.67	43.21
19800	49.01	48.22	46.75	46.02	46.08	44.55	44.01
21600	48.85	47.05	47.55	46.42	46.2	44.82	43.88
23400	48.22	47.12	46.99	46.53	46.15	44.5	44.12
25200				46.88		44.44	43.55

Table 3.23: The molar volume of Corsican pine samples modified with propionic anhydride at various temperatures.

Reaction Time(sec)	60°C MOL.VOL	70°C MOL.VOL	80°C MOL.VOL	90°C MOL.VOL	100°C MOL.VOL	110°C MOL.VOL	120°C MOL.VOL
900	83.12	79.22	81.55	79.55	81.214	81.33	89.22
1800	80.12	78.23	78.14	75.15	76.33	77.12	82.14
2700	79.33	77.16	77.23	70.23	74.552	73.55	75.23
3600	77.23	74.3	75.21	70.01	70.231	70.66	70.23
4500	74.33	70.33	70.23	69.55	69.231	69.32	69.22
5400	70.99	70.01	70.14	68.33	68.33	66.66	67.23
6300	70.66	69.23	69.55	69.01	67.05	66.11	66.23
7200	70.33	68.88	68.88	67.12	67.88	65.88	66.12
8100	69.88	68.02	68.06	66.88	66.02	65.23	65.88
9000	69.55	67.55	67.88	66.23	65.78	64.8	66.01
9900	68.88	67.67	68.14	67.12	65.54	64.22	65.55
10800	68.23	66.9	67.12	65.55	65	63.55	65.01
12600	67.99	66.2	66.23	65.01	64.78	63.22	64.23
14400	67.55	65.88	65.99	64.55	64.21	62.88	63.02
16200	67.01	65.42	65.01	65.01	64.01	62.55	63.12
18000	66.78	65.3	64.78	64.23	63.77	61.12	62.88
19800	66.23	64.88	64.35	63.99	63.21	61.33	62.14
21600	66.45	64.55	64.12	63.55	62.98	60.7	61.75
23400	66.68	64.01	63.88	63.12	62.55	61.14	61.55
25200					62.02	60.88	61.88

***Table 3.24**: The molar volume of Corsican pine samples modified with butyric anhydride at various temperatures.*

Reaction Time(sec)	60 °C MOL.VOL	70 °C MOL.VOL	80 °C MOL.VOL	90 °C MOL.VOL	100 °C MOL.VOL	110 °C MOL.VOL	120 °C MOL.VOL
900	117.22	105.12	103.55	106.22	105.23	101.22	107.22
1800	110.22	100.1	96.33	100.12	95.14	94.99	99.68
2700	108.22	96.22	95.88	96.22	94.23	90.22	95.12
3600	106.2	95.66	95.66	94.22	90.11	89.55	93.22
4500	104.66	94.55	94.22	92.11	89.66	88.88	90.23
5400	103.22	94.01	93.22	90.22	88.12	88.22	89.01
6300	102.33	92.33	92.55	89.66	87.22	85.16	87.55
7200	101.65	90.01	90.16	88.22	86.88	84.69	85.55
8100	98.22	89.55	88.22	87.22	86.21	83.99	84.33
9000	96.55	89.24	87.55	86.88	85.23	83.22	83.55
9900	95.33	88.55	87.01	85.99	85.01	83.01	82.99
10800	94.22	88.22	85.66	85.33	84.78	82.55	82.55
12600	93.12	87.55	85.12	84.23	83.12	82.14	81.88
14400	92.55	87.01	84.33	83.22	82.65	81.88	81.53
16200	90.22	86.55	83.22	82.23	82.14	82.26	82.14
18000	89.55	86.01	82.55	81.15	81.55	82.88	82.28
19800	89.11	84.12	82.01	82.33	81.22	81.59	81.33
21600	88.88	83.22	81.66	80.98	81.99	81.01	82.14
23400	88.25	82.22	80.66		82.22	79.55	81.53
25200					82.28	80.33	

Table 3.25: The molar volume of Corsican pine samples modified with valeric anhydride at various temperatures.

Reaction Time(sec)	60 °C MOL.VOL	70 °C MOL.VOL	80 °C MOL.VOL	90 °C MOL.VOL	100 °C MOL.VOL	110 °C MOL.VOL	120 °C MOL.VOL
900	121.55	115.23	118.22	114.22	112.33	115.06	116.12
1800	119.66	110.22	115.05	107.22	105.33	110.11	106.48
2700	120.2	108.5	114.2	104.22	104.11	105.22	103.21
3600	115.33	107.3	113.98	102.55	101.36	104.66	102.02
4500	114.23	106.33	114.22	101.2	99.22	103.88	101.1
5400	107.23	106.11	112.88	100.21	98.55	103.01	99.52
6300	106.33	105.66	106.21	99.55	97.88	102.2	98.22
7200	105.22	104.55	105.3	98.23	97.22	101.88	98.01
8100	104.22	103.22	104.8	97.55	97.25	101.2	97.55
9000	103.88	102.8	104.22	97.01	96.99	100.55	97.33
9900	103.44	102.55	103.21	97.23	96.65	99.99	97.44
10800	102.55	101.88	102.2	96.55	97.33	99.4	97.11
12600	101.21	101.2	101.66	96.88	97.88	99.22	97.01
14400	99.22	100.55	99.22	98.15	98.5	98.88	98.16
16200	98.85	100.01	98.87	98.22	99.01	98.21	98.46
18000	98.22	99.75	98.32	98.88	99.24	97.22	99.08
19800	97.55	99.21	97.55	99.25	99.85	97.55	99.01
21600	97.2	99.01	97.12	99.55	100.2	98.01	99.55
23400	97.61	98.55	96.65		102.33	97.11	
25200			96.24				

Table 3.26: The molar volume of Corsican pine samples modified with hexanoic anhydride at various temperatures.

Reaction Time(sec)	60 °C MOL.VOL	70 °C MOL.VOL	80 °C MOL.VOL	90 °C MOL.VOL	100 °C MOL.VOL	110 °C MOL.VOL	120 °C MOL.VOL
900	141.2	138.5	137.55	134.3	133.3	134.22	141.55
1800	127.6	132.6	126.2	125.6	124.9	126.2	134.5
2700	126.2	126.5	124.3	122.5	122.5	122.3	129.55
3600	125.4	125.3	123.5	124.3	120.5	120.2	124.9
4500	124.6	124.33	122.6	120.8	120.1	119.5	123.6
5400	121.6	123.2	121.7	120.2	119.5	119.1	121.3
6300	120.5	122.8	120.1	119.8	119.5	118.8	120.5
7200	119.8	121.5	119.5	119.3	118.2	117.3	119.6
8100	119.6	121.1	119.1	118.4	117.2	116.5	118.3
9000	118.8	120.6	118.2	117.5	116.5	115.6	117.2
9900	118.3	119.6	119.5	116.8	115.2	115.5	116.2
10800	117.5	120.3	119.8	116.1	114.8	115.2	115.8
12600	117.1	119.3	118.3	115.3	114.2	115.8	115.1
14400	115.3	118.8	116.9	115.1	115.1	116.2	116.2
16200	115.1	118.1	117.3	114.8	115.3	116.5	115.8
18000	116.3	117.6	117.1	115.3	114.8	115.9	117.4
19800	115.8	117.1	116.9	115.8	115.8	117.1	117.8
21600	116.5	116.8	117.8	114.5	116.2	117.3	117.3
23400	117.2	115.2	118.1		116.8		
25200	117.5						

Table 3.27: The molar volume of Scots pine samples modified with acetic anhydride at various temperatures.

Reaction Time(sec)	60 °C MOL.VOL	70 °C MOL.VOL	80 °C MOL.VOL	90 °C MOL.VOL	100 °C MOL.VOL	110 °C MOL.VOL	120 °C MOL.VOL
900	67.27719	58.62726	54.71878	65.1414	46.63532	47.17136	50.04766
1800	60.3516	54.71878	52.61421	56.99873	43.19904	43.19904	43.19904
2700	56.99873	50.04766	50.66554	59.47693	41.45362	42.30833	42.74905
3600	48.28128	52.61421	46.63532	45.59898	41.03908	41.45362	42.30833
4500	46.63532	47.71987	44.6077	46.63532	41.45362	41.87662	41.45362
5400	44.6077	43.19904	45.59898	45.0979	39.84377	41.03908	40.63276
6300	47.17136	41.45362	41.45362	43.19904	39.08484	41.45362	41.03908
7200	43.19904	41.03908	40.2344	41.45362	41.45362	41.87662	40.63276
8100	40.63276	43.19904	39.46066	39.84377	41.87662	40.63276	41.45362
9000	41.87662	39.08484	41.03908	41.45362	35.68616	39.84377	41.87662
9900	47.71987	39.84377	41.45362	42.74905	35.07614	39.08484	41.45362
10800	39.08484	38.71612	46.63532	37.30826	40.2344	41.03908	41.03908
12600	43.19904	41.45362	40.63276	35.68616	38.71612	41.45362	40.63276
14400	46.63532	41.03908	39.08484	39.08484	40.63276	41.87662	39.84377
16200	42.30833	41.87662	41.45362	41.45362	41.45362	41.03908	41.03908
18000	41.45362	39.08484	40.63276	38.71612	38.71612	40.63276	39.46066
19800	40.63276	38.35428	40.2344	37.65054	35.07614	40.63276	41.03908
21600	39.84377	39.46066	41.87662	37.30826	36.64204	39.84377	40.63276
23400	39.08484	41.45362	39.46066	37.99915	37.30826	41.03908	41.45362
25200	40.63276	38.71612	39.84377	39.08484	39.08484	41.45362	40.63276

Table 3.28: The molar volume of Scots pine samples modified with propionic anhydride at various temperatures.

Reaction Time(sec)	60 °C MOL.VOL	70 °C MOL.VOL	80 °C MOL.VOL	90 °C MOL.VOL	100 °C MOL.VOL	110 °C MOL.VOL	120 °C MOL.VOL
900	69.46574	66.27191	67.83125	67.04252	61.99631	61.99631	70.31288
1800	67.04252	65.51882	64.78266	63.35886	60.69112	60.69112	60.69112
2700	66.27191	64.78266	64.78266	60.05892	58.23896	61.33677	59.43976
3600	64.06285	62.67018	61.99631	58.83323	57.08571	58.83323	58.23896
4500	61.99631	60.05892	60.05892	58.23896	57.65657	57.65657	57.65657
5400	60.05892	58.83323	58.83323	56.52604	56.52604	57.08571	57.08571
6300	58.83323	58.23896	58.23896	57.65657	58.23896	58.23896	57.08571
7200	59.43976	54.91101	57.65657	55.43901	53.88464	58.83323	58.23896
8100	58.23896	56.52604	58.23896	54.91101	55.43901	60.69112	58.23896
9000	58.23896	55.97725	55.97725	53.88464	56.52604	57.65657	58.83323
9900	57.65657	58.23896	54.39299	55.43901	57.65657	58.83323	59.43976
10800	57.08571	57.65657	54.91101	55.97725	57.08571	58.23896	57.65657
12600	58.23896	55.43901	56.52604	57.65657	56.52604	57.08571	57.08571
14400	56.52604	55.97725	57.08571	57.08571	51.94285	57.08571	56.52604
16200	55.97725	53.88464	57.65657	57.65657	57.08571	57.65657	58.23896
18000	56.52604	54.39299	57.08571	58.23896	57.65657	58.23896	58.83323
19800	55.43901	54.91101	58.23896	58.83323	58.23896	58.83323	57.08571
21600	55.97725	53.38571	57.65657	57.65657	57.08571	57.65657	57.65657
23400	55.43901	53.88464	57.08571	57.08571	58.23896	57.08571	57.08571
25200							

Table 3.29: The molar volume of Scots pine samples modified with butyric anhydride at various temperatures.

Reaction Time(sec)	60 °C MOL.VOL	70 °C MOL.VOL	80 °C MOL.VOL	90 °C MOL.VOL	100 °C MOL.VOL	110 °C MOL.VOL	120 °C MOL.VOL
900							
1800	98.61111	88.04563	88.04563	90.19309	92.44792	70.43651	94.81838
2700	92.44792	83.09925	81.27289	85.00958	84.04356	72.50817	80.38949
3600	89.10643	82.17593	82.17593	79.52509	80.38949	74.70539	77.85088
4500	91.30658	79.52509	80.38949	84.04356	77.85088	67.23485	73.22607
5400	87.0098	77.03993	77.85088	76.2457	73.22607	73.22607	72.50817
6300	88.04563	76.2457	76.2457	74.70539	62.14986	73.95833	74.70539
7200	85.00958	72.50817	65.44985	62.14986	73.95833	74.70539	75.46769
8100	85.00958	74.70539	73.95833	73.95833	75.46769	61.12259	73.95833
9000	83.09925	72.50817	74.70539	67.85168	76.2457	73.95833	66.03423
9900	80.38949	73.22607	71.11378	70.43651	70.43651	71.80421	64.31159
10800	78.67908	71.80421	70.43651	71.11378	69.11994	70.43651	75.46769
12600	76.2457	67.23485	71.80421	72.50817	70.43651	71.80421	73.95833
14400	73.22607	70.43651	72.50817	73.95833	71.80421	73.22607	72.50817
16200	75.46769	71.11378	73.95833	74.70539	73.95833	62.14986	73.22607
18000	73.95833	74.70539	71.80421	74.70539	73.22607	72.50817	72.50817
19800	74.70539	73.95833	73.22607	73.95833	74.70539	73.95833	73.95833
21600	72.50817	70.43651	73.95833	72.50817	73.95833	72.50817	71.80421
23400	73.95833	71.80421	72.50817	71.80421	73.22607	73.22607	72.50817
25200	73.2607	71.11378	72.50817	72.50817	73.95833	73.95833	73.22607

Table 3.30: The molar volume of Scots pine samples modified with valeric anhydride at various temperatures.

Reaction Time(sec)	60 °C MOL.VOL	70 °C MOL.VOL	80 °C MOL.VOL	90 °C MOL.VOL	100 °C MOL.VOL	110 °C MOL.VOL	120 °C MOL.VOL
900	107.6494	106.383	107.6494	107.6494	105.146	106.383	110.275
1800	105.146	96.19737	98.28862	101.6017	97.23175	96.19737	101.6017
2700	102.7563	94.19326	98.28862	98.28862	95.18477	91.33892	95.18477
3600	97.23175	98.28862	102.7563	97.23175	91.33892	90.42553	93.2222
4500	100.4728	92.27095	93.2222	108.9464	90.42553	89.53023	92.27095
5400	94.19326	89.53023	97.23175	94.19326	89.53023	90.42553	90.42553
6300	92.27095	91.33892	102.7563	95.18477	88.65248	92.27095	89.53023
7200	73.51669	75.35461	95.18477	91.33892	89.53023	91.33892	91.33892
8100	87.79178	86.94763	92.27095	76.63181	91.33892	88.65248	90.42553
9000	90.42553	87.79178	81.46444	92.27095	74.73184	89.53023	89.53023
9900	91.33892	86.94763	89.53023	90.42553	89.53023	91.33892	91.33892
10800	86.11955	91.33892	88.65248	92.27095	92.27095	91.33892	91.33892
12600	86.94763	88.65248	90.42553	91.33892	91.33892	90.42553	90.42553
14400	87.79178	70.64495	91.33892	89.53023	86.11955	91.33892	88.65248
16200	86.11955	90.42553	90.42553	88.65248	88.65248	91.33892	89.53023
18000	99.36872	91.33892	89.53023	86.94763	89.53023	90.42553	91.33892
19800	91.33892	90.42553	88.65248	88.65248	90.42553	91.33892	91.33892
21600	90.42553	88.65248	89.53023	90.42553	91.33892	90.42553	90.42553
23400	89.53023	89.53023	91.33892	89.53023	90.42553	89.53023	91.33892
25200							

Table 3.31: The molar volume of Scots pine samples modified with hexanoic anhydride at various temperatures.

Reaction Time(sec)	60 °C MOL.VOL	70 °C MOL.VOL	80 °C MOL.VOL	90 °C MOL.VOL	100 °C MOL.VOL	110 °C MOL.VOL	120 °C MOL.VOL
900	120.9677	122.3582	119.6086	115.7083	115.7083	122.3582	128.255
1800	108.6241	113.2464	107.5269	107.5269	106.4516	107.5269	114.4641
2700	110.8871	109.7439	106.4516	106.4516	105.3976	105.3976	110.8871
3600	105.3976	112.0543	105.3976	108.6241	102.3573	103.3511	106.4516
4500	107.5269	107.5269	108.6241	109.7439	100.426	108.6241	105.3976
5400	105.3976	106.4516	103.3511	101.3825	106.4516	109.7439	106.4516
6300	102.3573	105.3976	100.426	102.3573	108.6241	103.3511	108.6241
7200	101.3825	102.3573	87.97654	103.3511	98.56631	102.3573	108.6241
8100	95.90235	103.3511	90.21323	100.426	99.48749	93.37861	107.5269
9000	101.3825	87.25542	101.3825	90.21323	95.90235	107.5269	105.3976
9900	104.3643	99.48749	98.56631	92.56662	81.26077	100.426	106.4516
10800	85.16129	101.3825	96.77419	98.56631	99.48749	102.3573	107.5269
12600	101.3825	104.3643	112.0543	104.3643	102.3573	87.97654	107.5269
14400	102.3573	106.4516	108.6241	104.3643	106.4516	101.3825	107.5269
16200	104.3643	107.5269	107.5269	107.5269	107.5269	104.3643	108.6241
18000	106.4516	107.5269	106.4516	107.5269	106.4516	106.4516	106.4516
19800	107.5269	106.4516	106.4516	106.4516	108.6241	107.5269	107.5269
21600	106.4516	105.3976	104.3643	108.6241	107.5269	105.3976	107.5269
23400	105.3976	106.4516	106.4516	107.5269	105.3976	107.5269	107.5269
25200							

Table 3.32: *Densities of the relevant carboxylic acids (Source: Aldrich, 2002)*

Carboxylic acid	Density (gr/cm^3)
Acetic	1.049
Propionic	0.992
Butyric	0.964
Valeric	0.938
Hexanoic	0.929

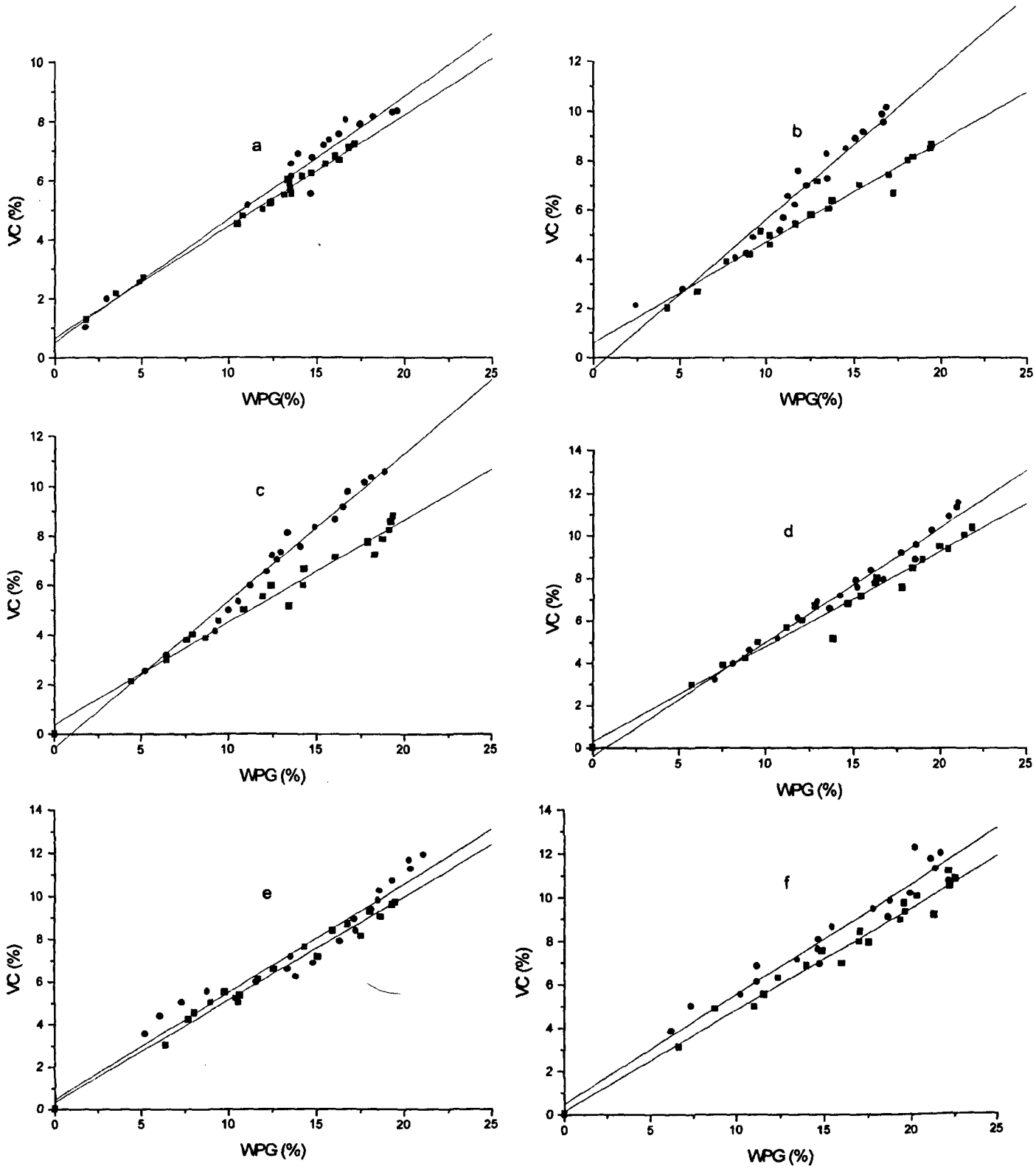


Figure 3.1: Relationship between percentage volume increase and WPG of Corsican pine (circles) or Scots pine (squares) modified with acetic anhydride at 60^{O} (R^2=0.99 and R^2=0.98) (a), 70 ^{O} (R^2=0.97 and R^2=0.97) (b), 80 ^{O} (R^2=0.98 and R^2=0.99) (c), 90 ^{O} (R^2=0.98 and R^2=0.99) (d), 100 ^{O} (e) (R^2=0.99 and R^2=0.97) and 110 ^{O} (f) (R^2=0.98 and R^2=0.97).

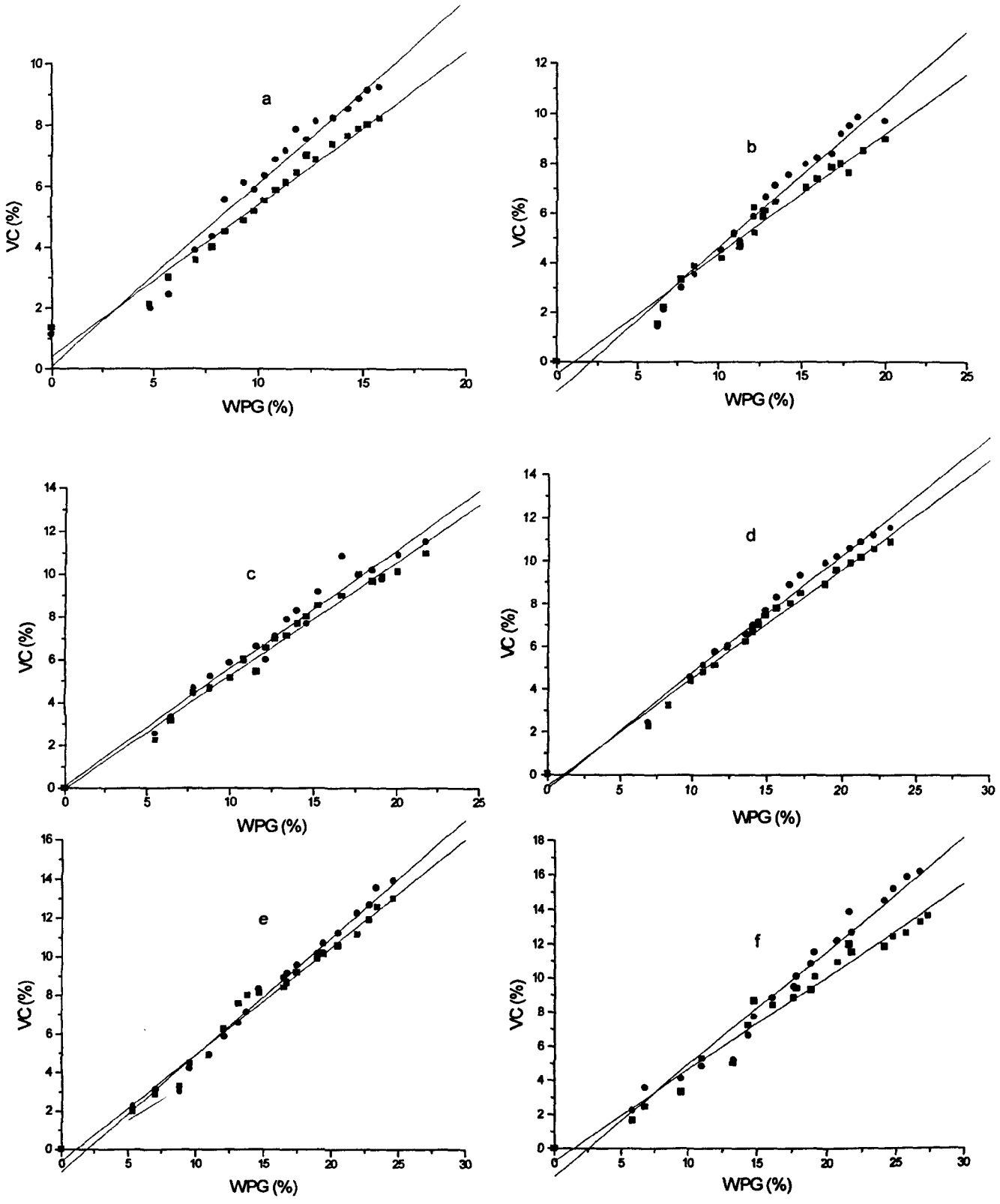


Figure 3.2: *Relationship between percentage volume increase and WPG of Corsican pine (circles) or Scots pine (squares) modified with propionic anhydride at 60^{O} (R^2=0.98 and R^2=0.97) (a), 70 ^{O} (R^2=0.98 and R^2=0.98) (b), 80 ^{O} (R^2=0.99 and R^2=0.98) (c), 90 ^{O} (R^2=0.99 and R^2=0.99) (d), 100 ^{O} (e) (R^2=0.99 and R^2=0.99) and 110^{O} (f) (R^2=0.98 and R^2=0.98).*

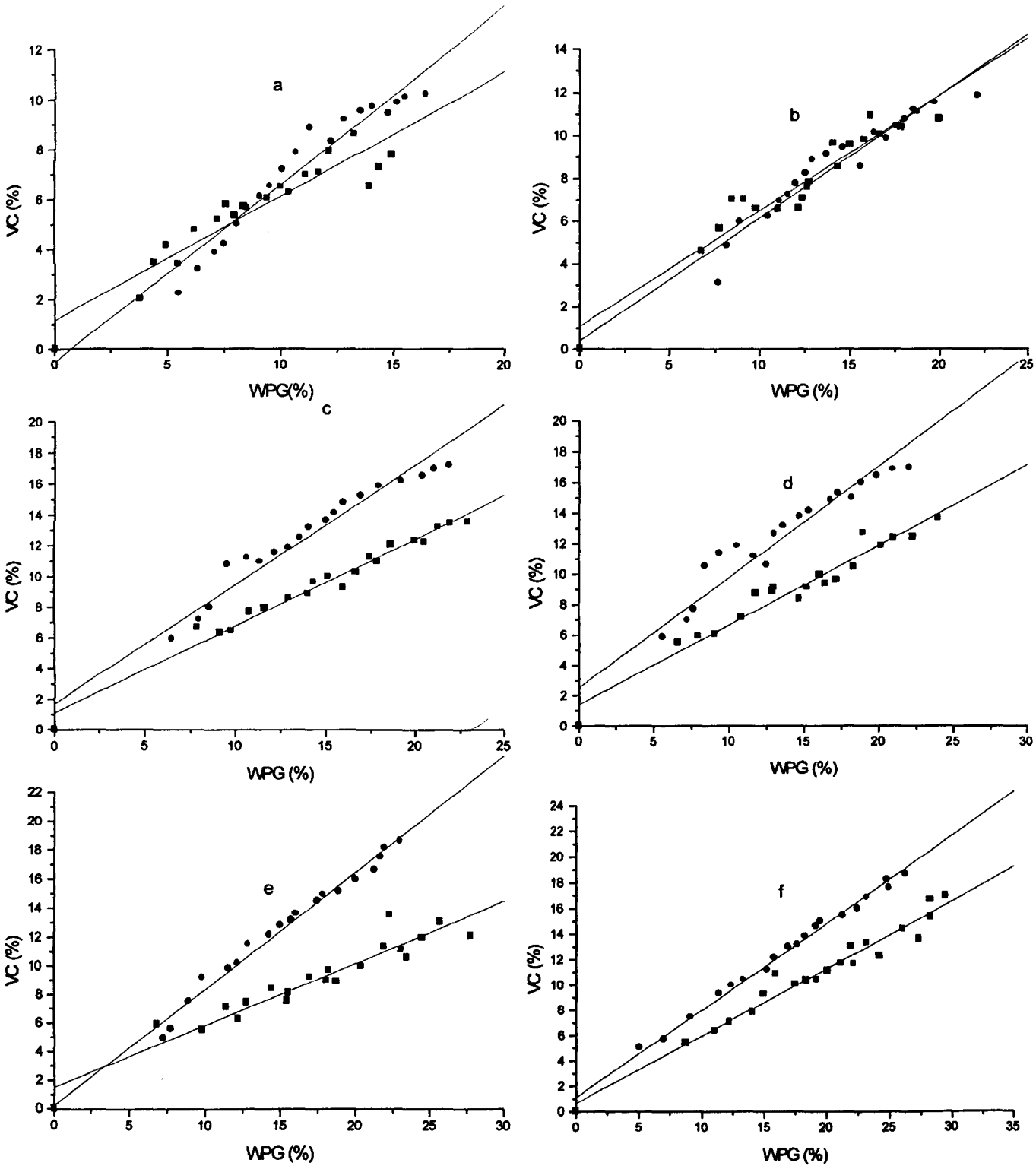


Figure 3.3: *Relationship between percentage volume increase and WPG of Corsican pine (circles) or Scots pine (squares) modified with butyric anhydride at 60^{O} (R^2=0.95 and R^2=0.97) (a), 70 ^{O} (R^2=0.96 and R^2=0.97) (b), 80 ^{O} (R^2=0.98 and R^2=0.97) (c), 90 ^{O} (R^2=0.97 and R^2=0.96) (d), 100 ^{O} (e) (R^2=0.95 and R^2=0.99) and 110 ^{O} (f) (R^2=0.98 and R^2=0.99).*

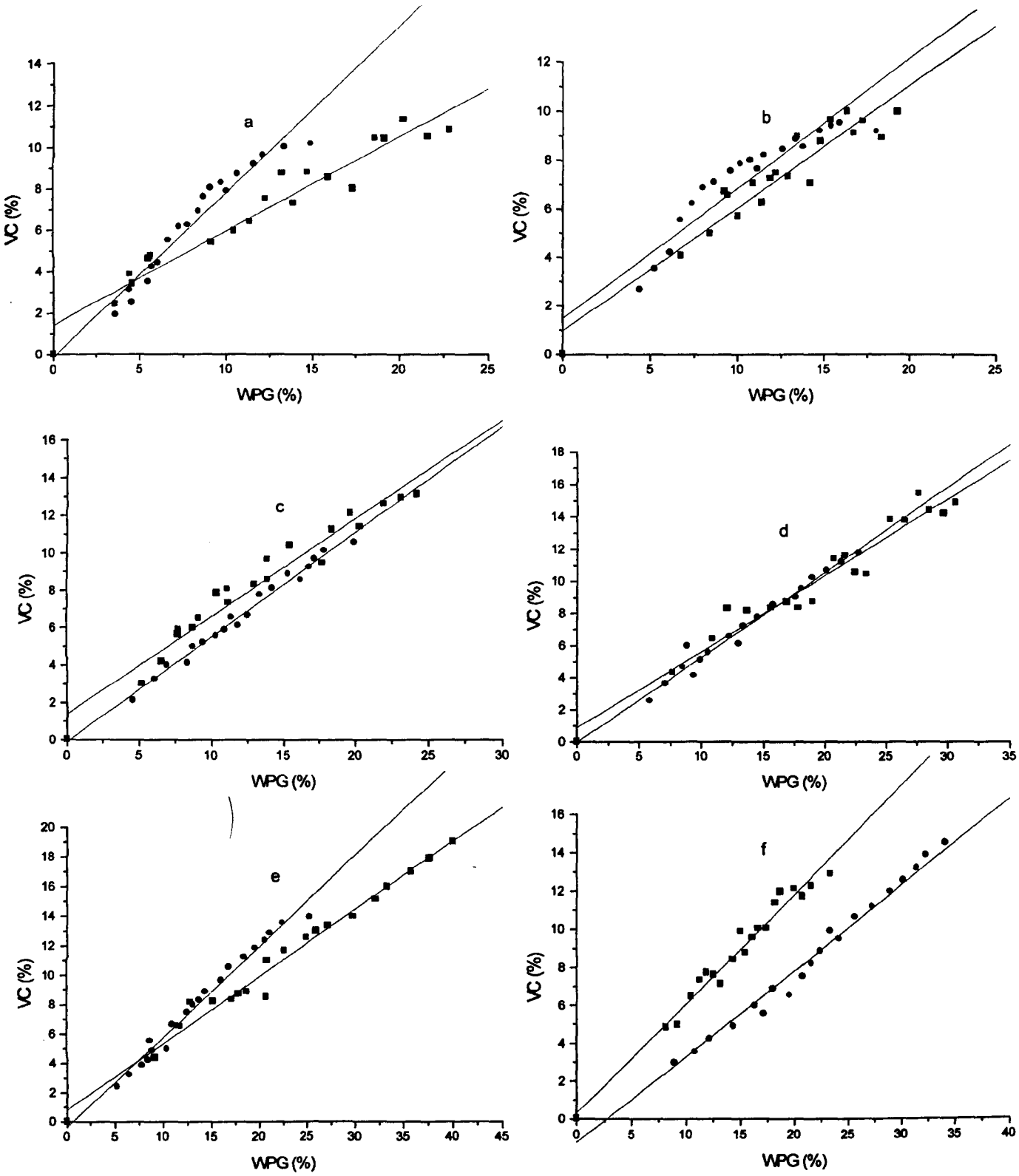


Figure 3.4: *Relationship between percentage volume increase and WPG of Corsican pine (circles) or Scots pine (squares) modified with valeric anhydride at 60^{O} (R^2=0.97 and R^2=0.97) (a), 70 ^{O} (R^2=0.95 and R^2=0.93) (b), 80 ^{O} (R^2=0.97 and R^2=0.99) (c), 90 ^{O} (R^2=0.97 and R^2=0.98) (d), 100 ^{O} (e) (R^2=0.99 and R^2=0.99) and 110 ^{O} (f) (R^2=0.98 and R^2=0.99).*

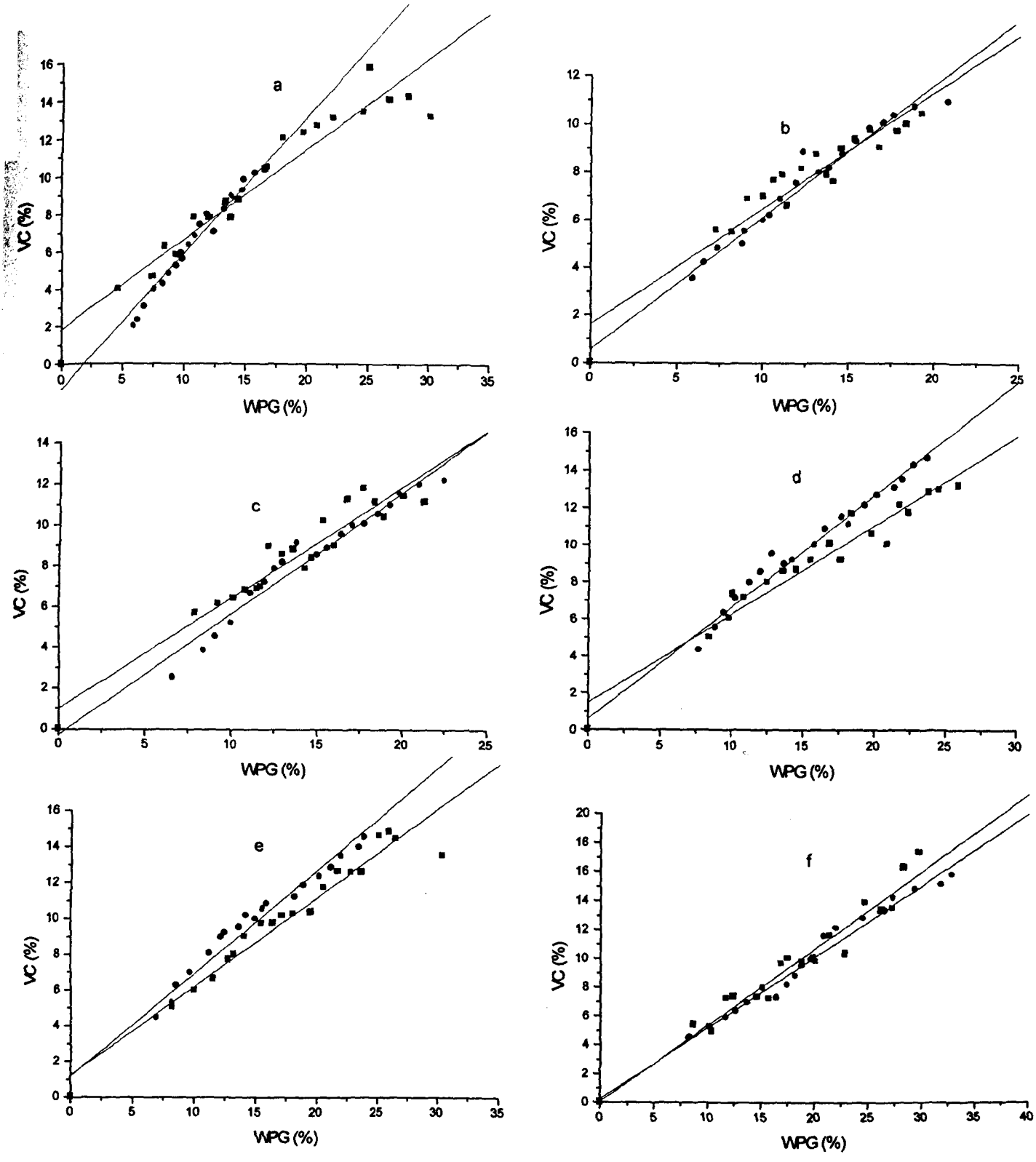


Figure 3.5: *Relationship between percentage volume increase and WPG of Corsican pine (circles) or Scots pine (squares) modified with hexanoic anhydride at 60^{O} (R^2=0.95 and R^2=0.98) (a), 70 ^{O} (R^2=0.96 and R^2=0.98) (b), 80 ^{O} (R^2=0.95 and R^2=0.98) (c), 90 ^{O} (R^2=0.97 and R^2=0.99) (d), 100 ^{O} (e) (R^2=0.97 and R^2=0.98) and 110 ^{O} (f) (R^2=0.99 and R^2=0.99).*

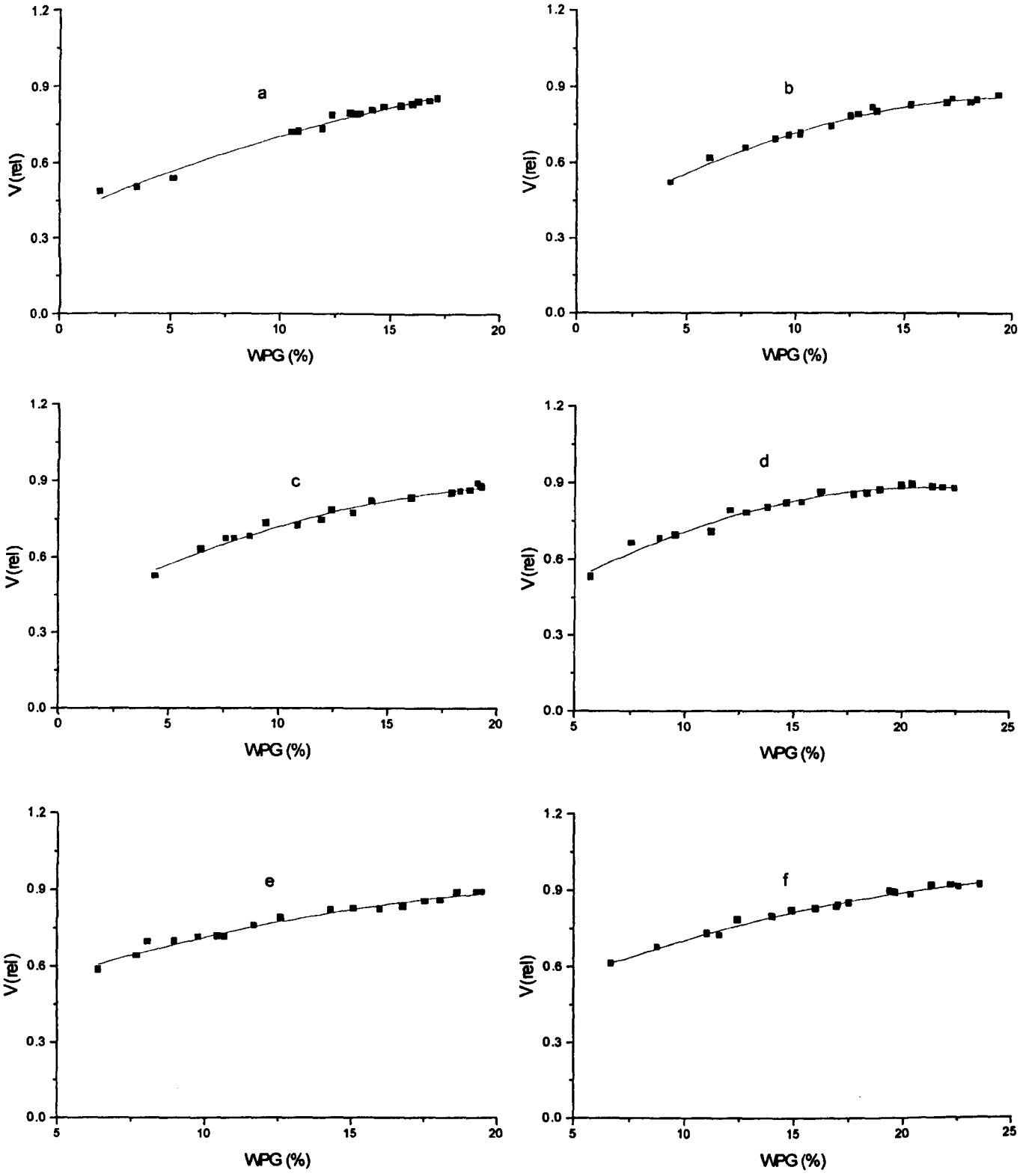


Figure 3.6: *Relationship between ratio of theoretical volume and measured volume increase (V(rel)) and WPG of Corsican pine samples modified with acetic anhydride at 60 ^{0}C (a), 70 ^{0}C (b), 80 ^{0}C (c), 90 ^{0}C (d), 100 ^{0}C (e), 110 ^{0}C (f).*

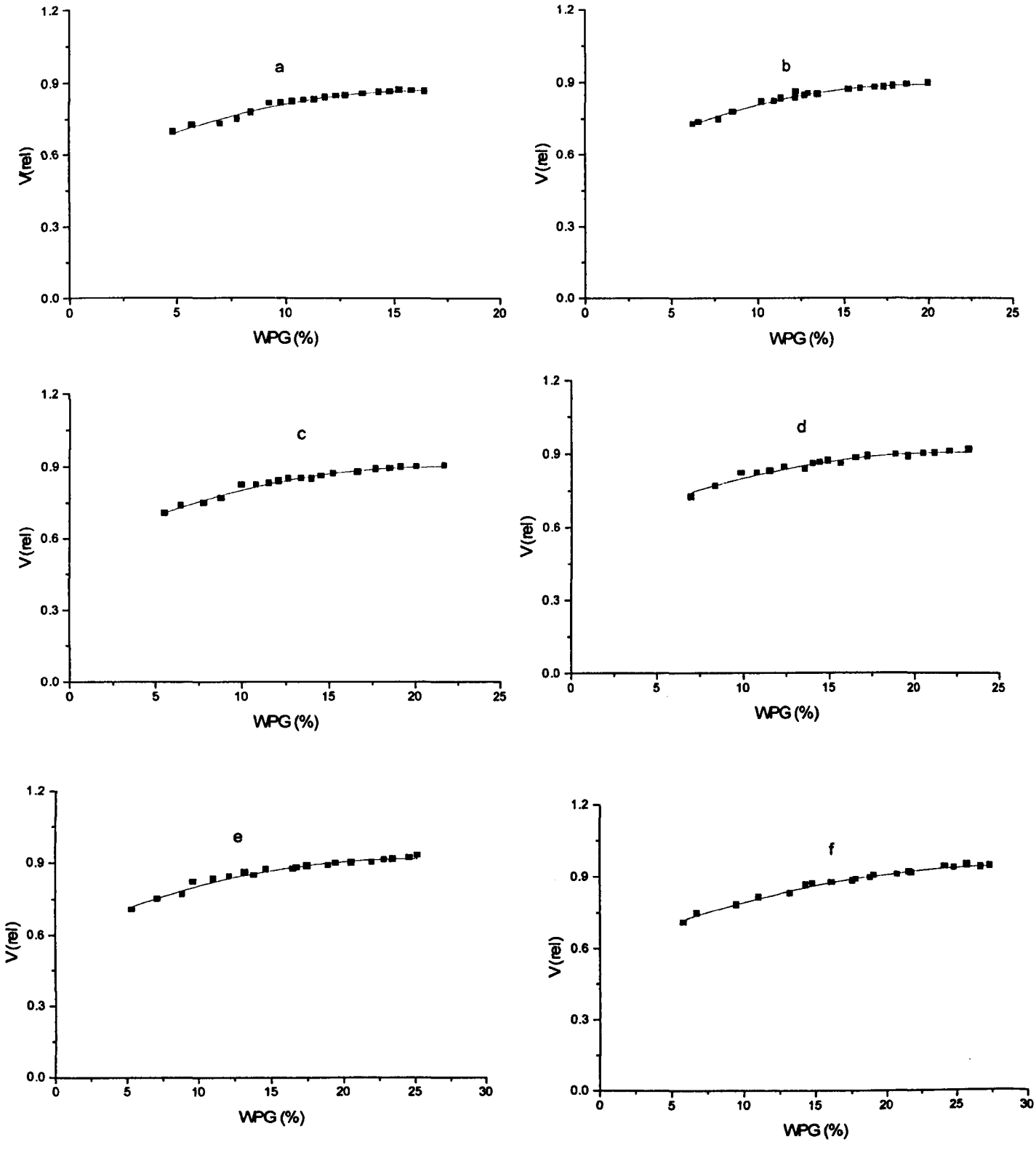


Figure 3.7: Relationship between ratio of theoretical volume and measured volume increase ((V (rel)) of Corsican pine samples modified with propionic anhydride at 60 ^{0}C (a), 70 ^{0}C (b), 80 ^{0}C (c), 90 ^{0}C (d), 100 ^{0}C (e), 110 ^{0}C (f).

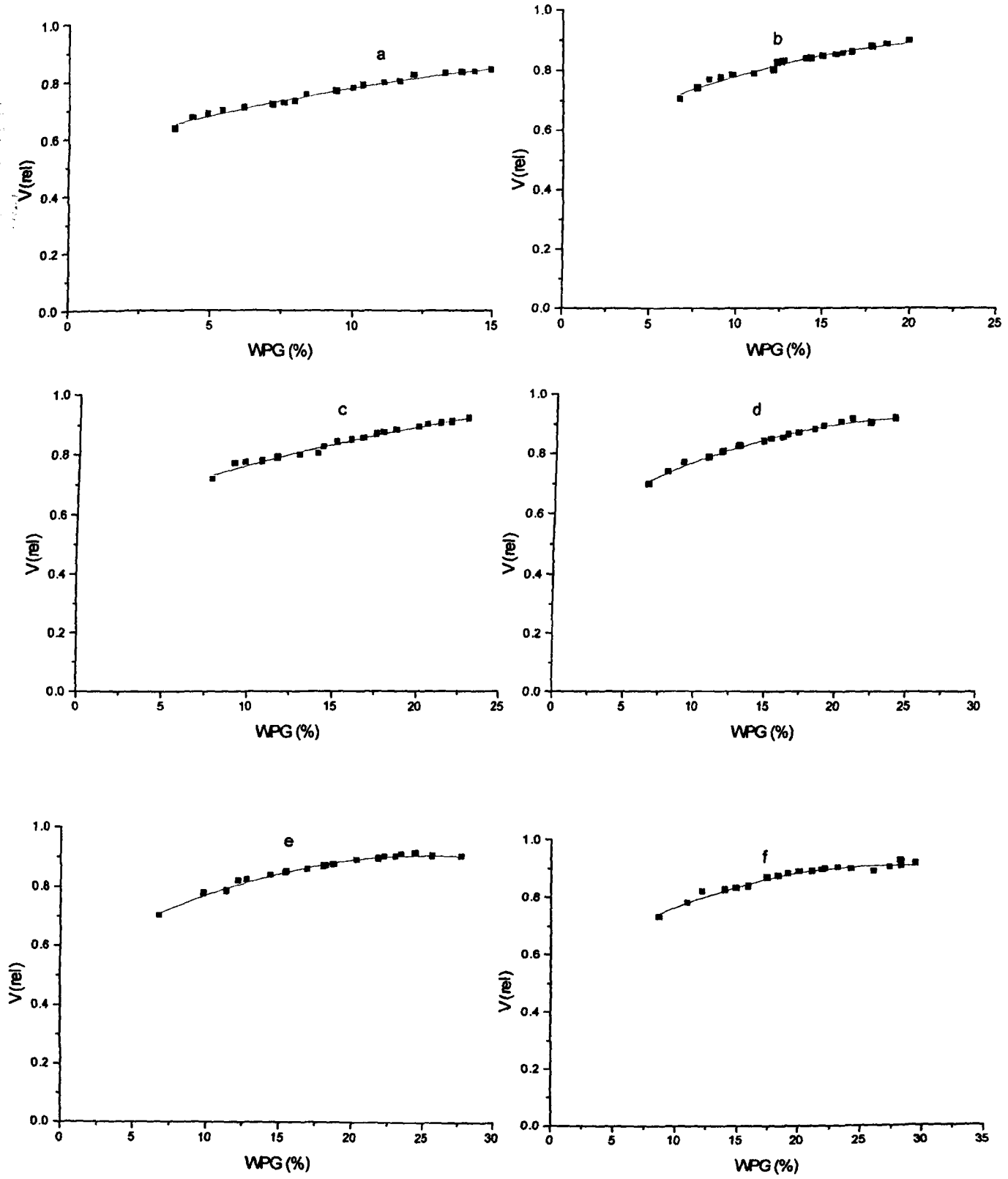


Figure 3.8: Relationship between ratio of theoretical volume and measured volume increase (V(rel)) and WPG of Corsican pine samples modified with butyric anhydride at 60 ^{0}C (a), 70 ^{0}C (b), 80 ^{0}C (c), 90 ^{0}C (d), 100 ^{0}C (e), 110 ^{0}C (f).

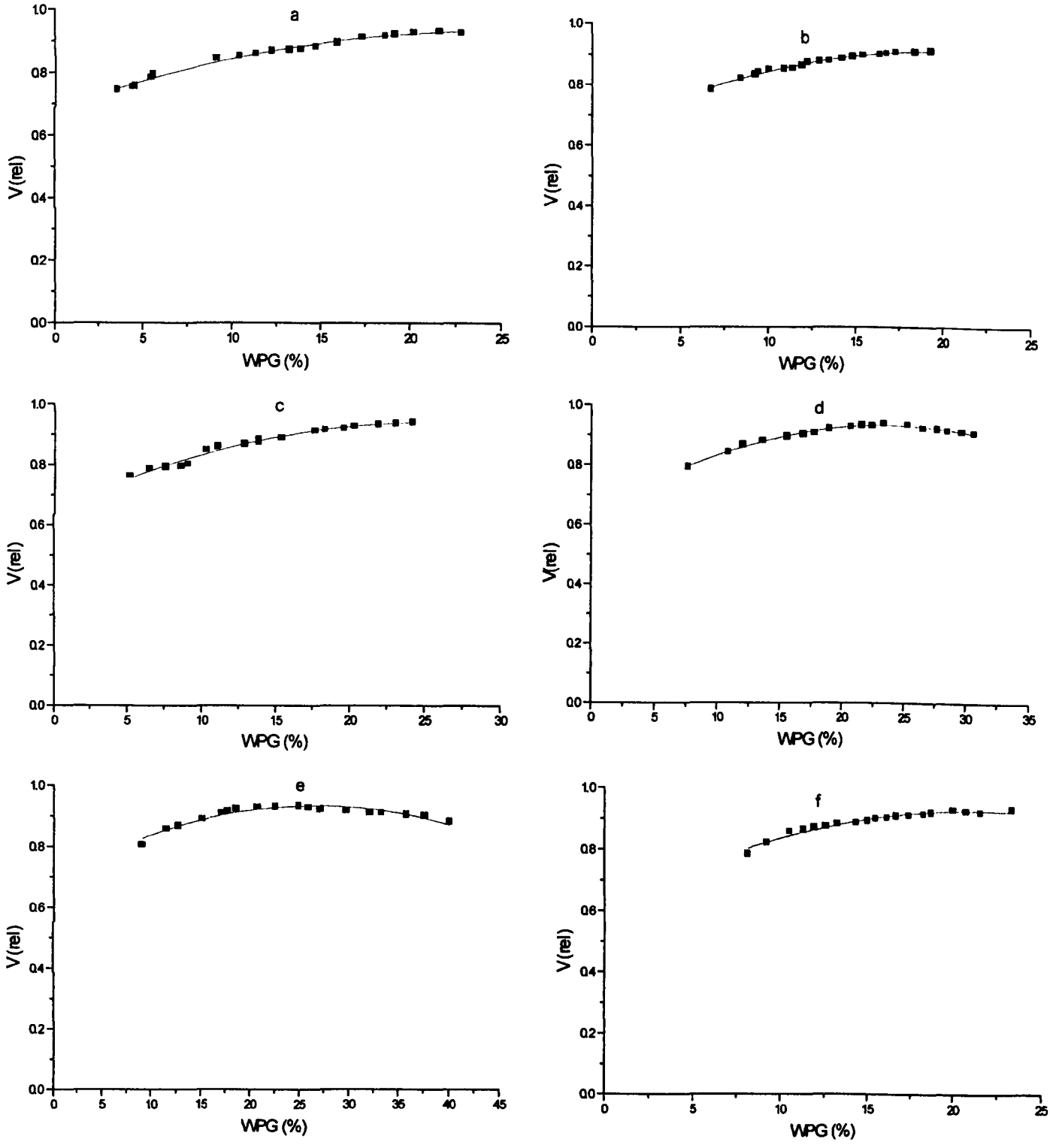


Figure 3.9: Relationship between ratio of theoretical volume and measured volume increase (V(rel)) and WPG of Corsican pine samples modified with valeric anhydride at 60 ^{0}C (a), 70 ^{0}C (b), 80 ^{0}C (c), 90 ^{0}C (d), 100 ^{0}C (e), 110 ^{0}C (f).

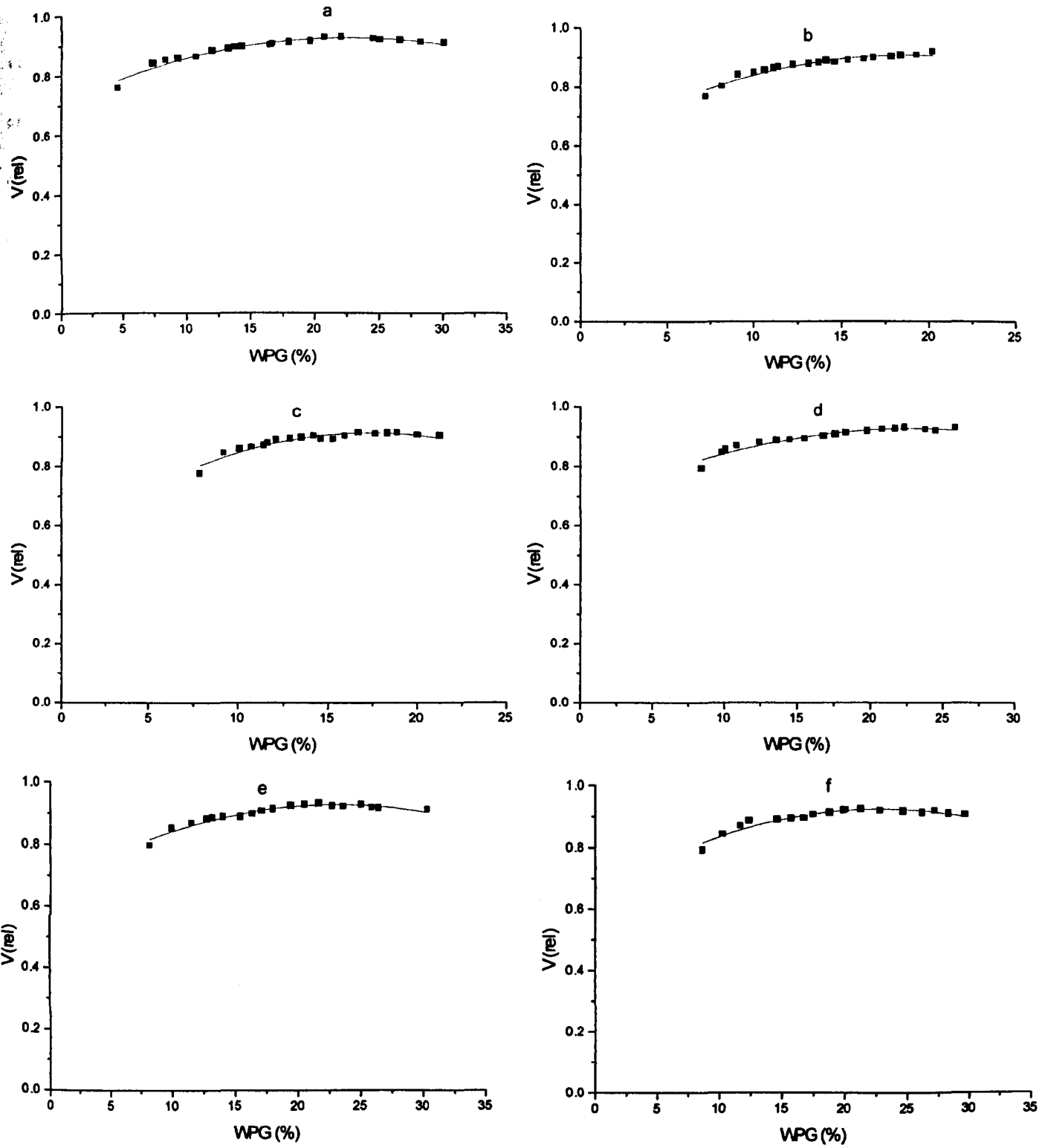


Figure 3.10: Relationship between ratio of theoretical volume and measured volume increase (V(rel)) and WPG of Corsican pine samples modified with hexanoic anhydride at 60 ^{0}C (a), 70 ^{0}C (b), 80 ^{0}C (c), 90 ^{0}C (d), 100 ^{0}C (e), 110 ^{0}C (f).

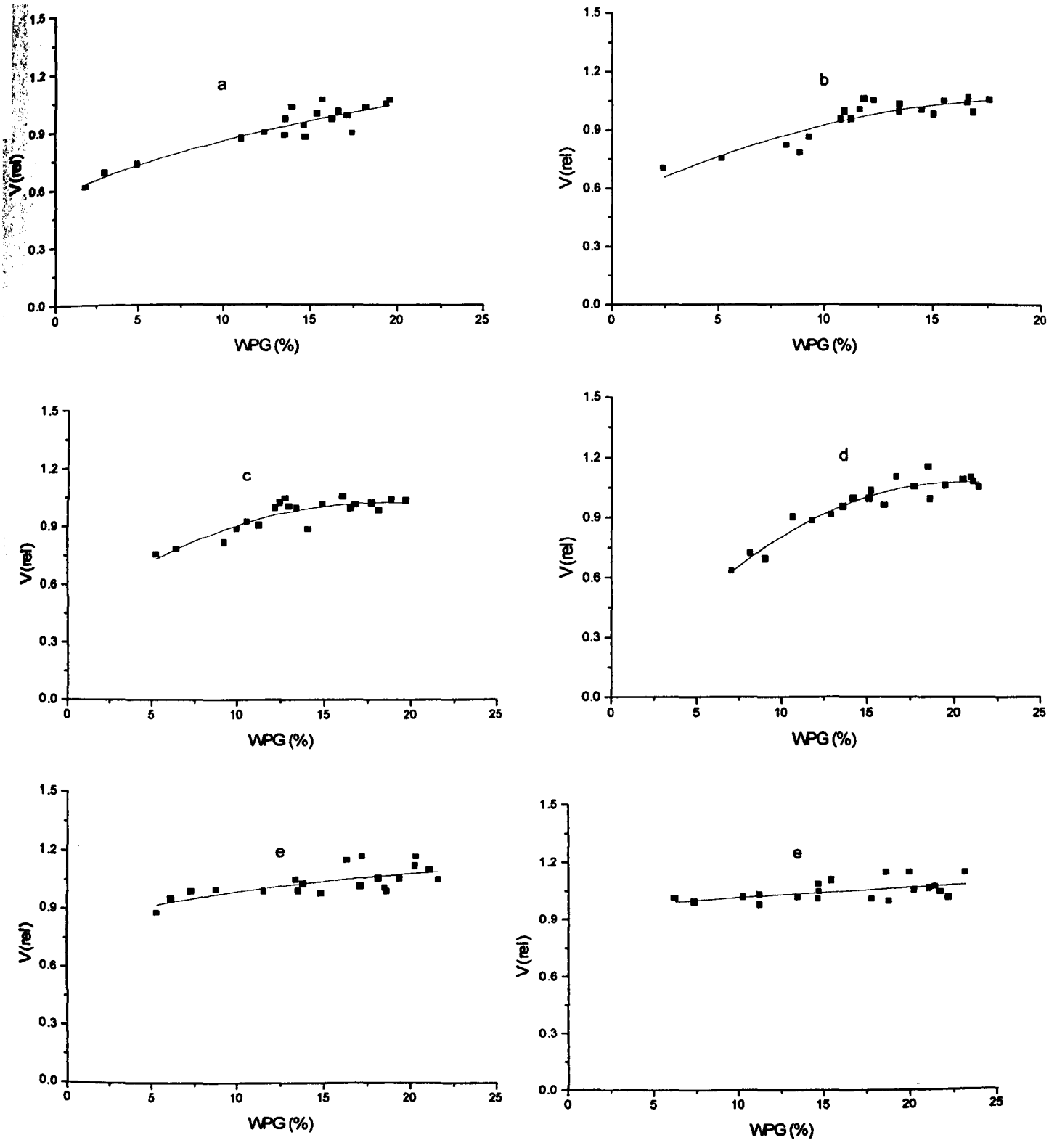


Figure 3.11: Relationship between ratio of theoretical volume and measured volume increase (V(rel))and WPG of Scots pine samples modified with acetic anhydride at 60^{O} (a), 70^{O} (b), 80^{O} (c), 90^{O} (d), 100^{O} (e) and 110^{O} (f).

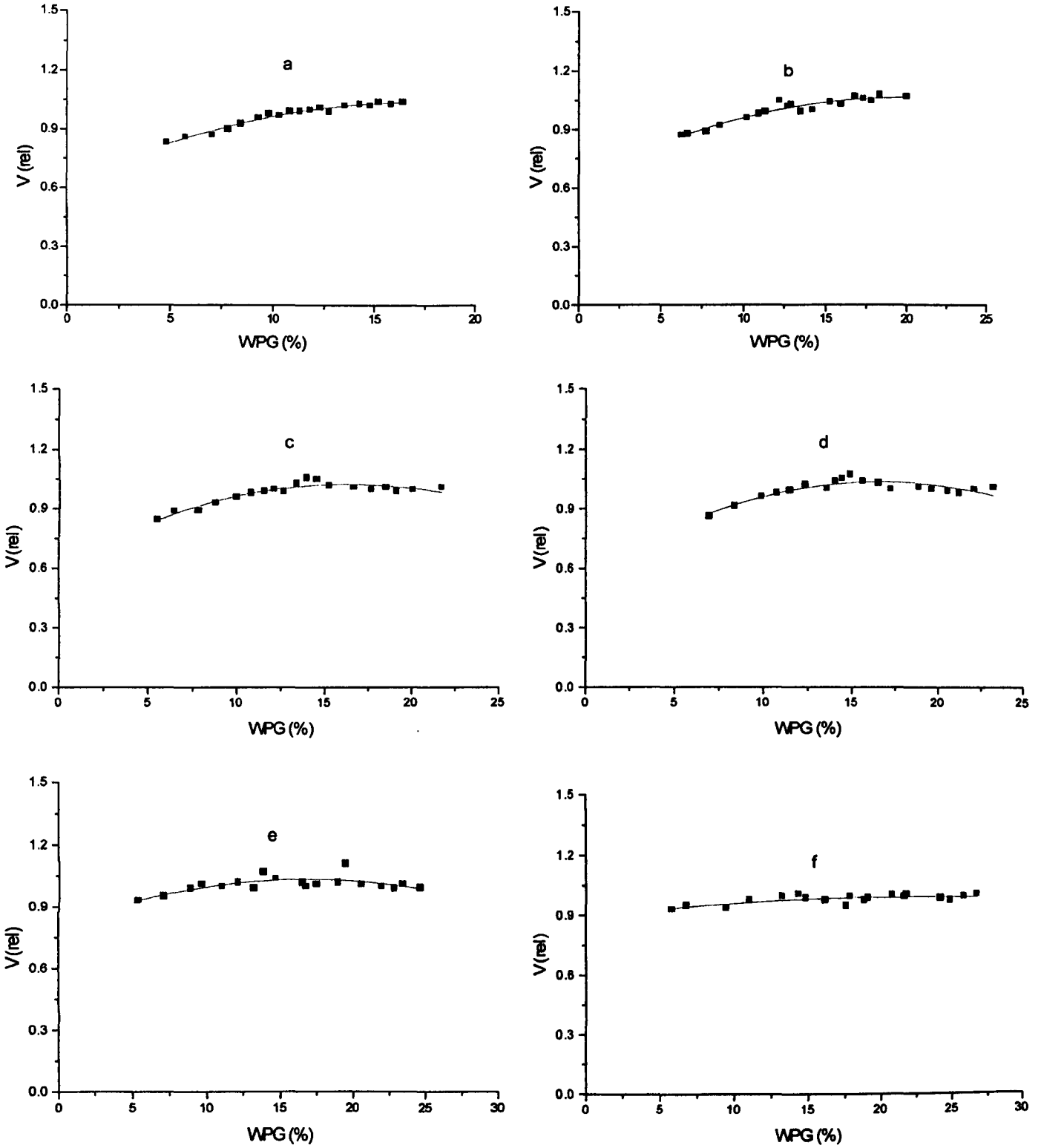


***Figure 3.12**: Relationship between ratio of theoretical volume and measured volume increase ((V (rel)) of Scots pine samples modified with propionic anhydride at 60 ^{0}C (a), 70 ^{0}C (b), 80 ^{0}C (c), 90 ^{0}C (d), 100 ^{0}C (e), 110 ^{0}C (f).*

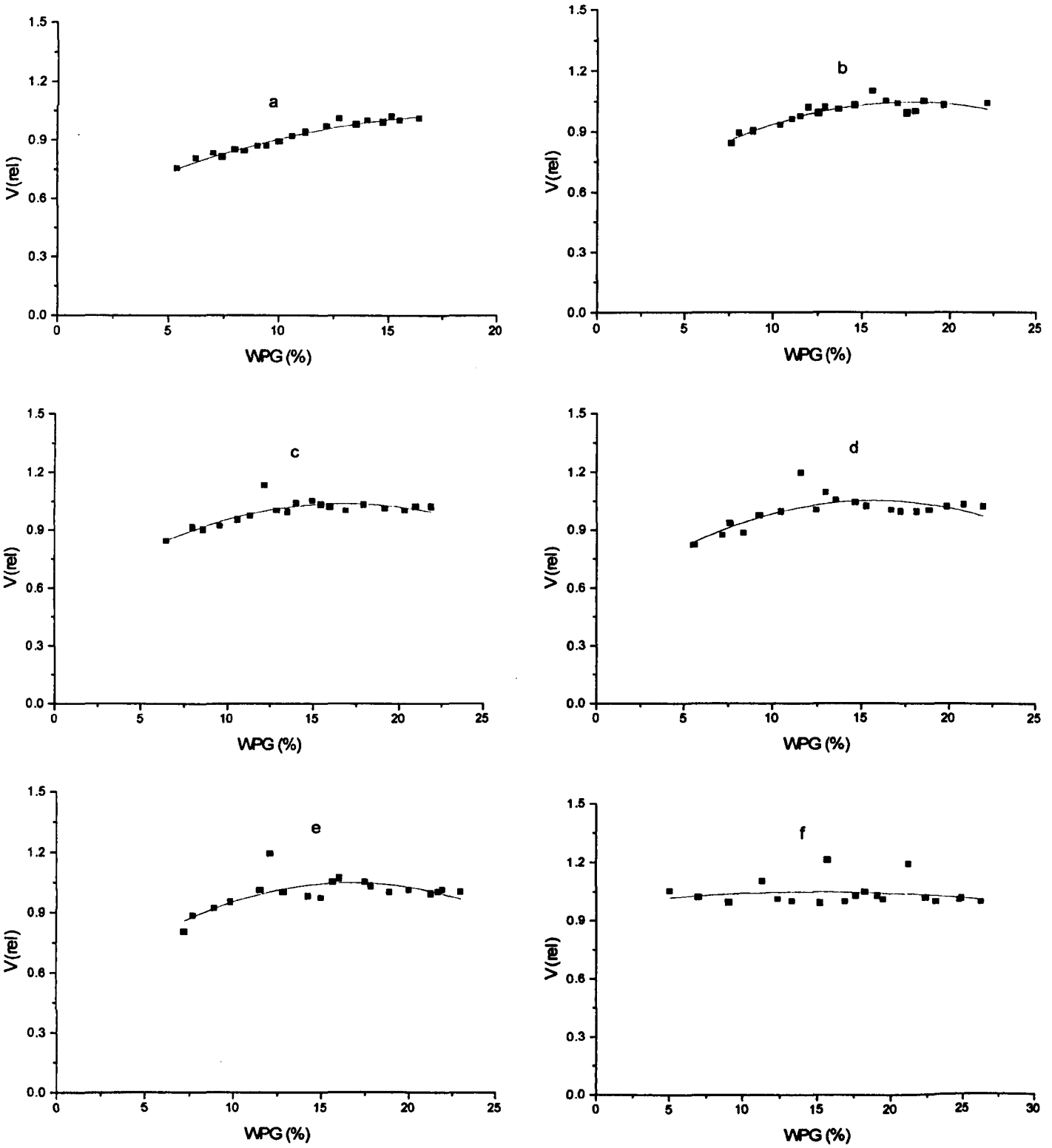


Figure 3.13: Relationship between ratio of theoretical volume and measured volume increase ((V (rel)) of Scots pine samples modified with butyric anhydride at 60 ^{0}C (a), 70 ^{0}C (b), 80 ^{0}C (c), 90 ^{0}C (d), 100 ^{0}C (e), 110 ^{0}C (f).

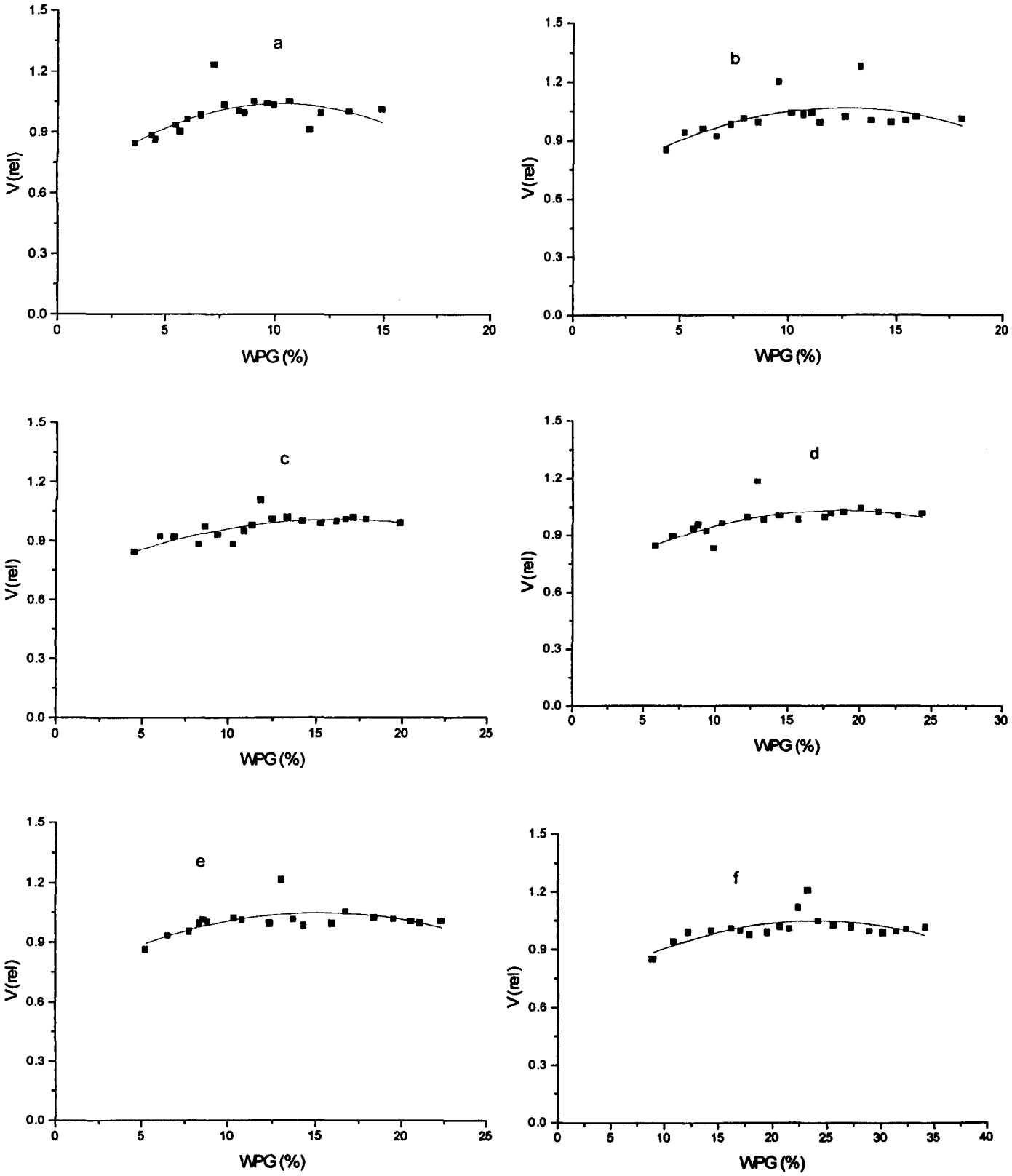


Figure 3.14: Relationship between ratio of theoretical volume and measured volume increase ((V (rel)) of Scots pine samples modified with valeric anhydride at 60 ^{0}C (a), 70 ^{0}C (b), 80 ^{0}C (c), 90 ^{0}C (d), 100 ^{0}C (e), 110 ^{0}C (f).

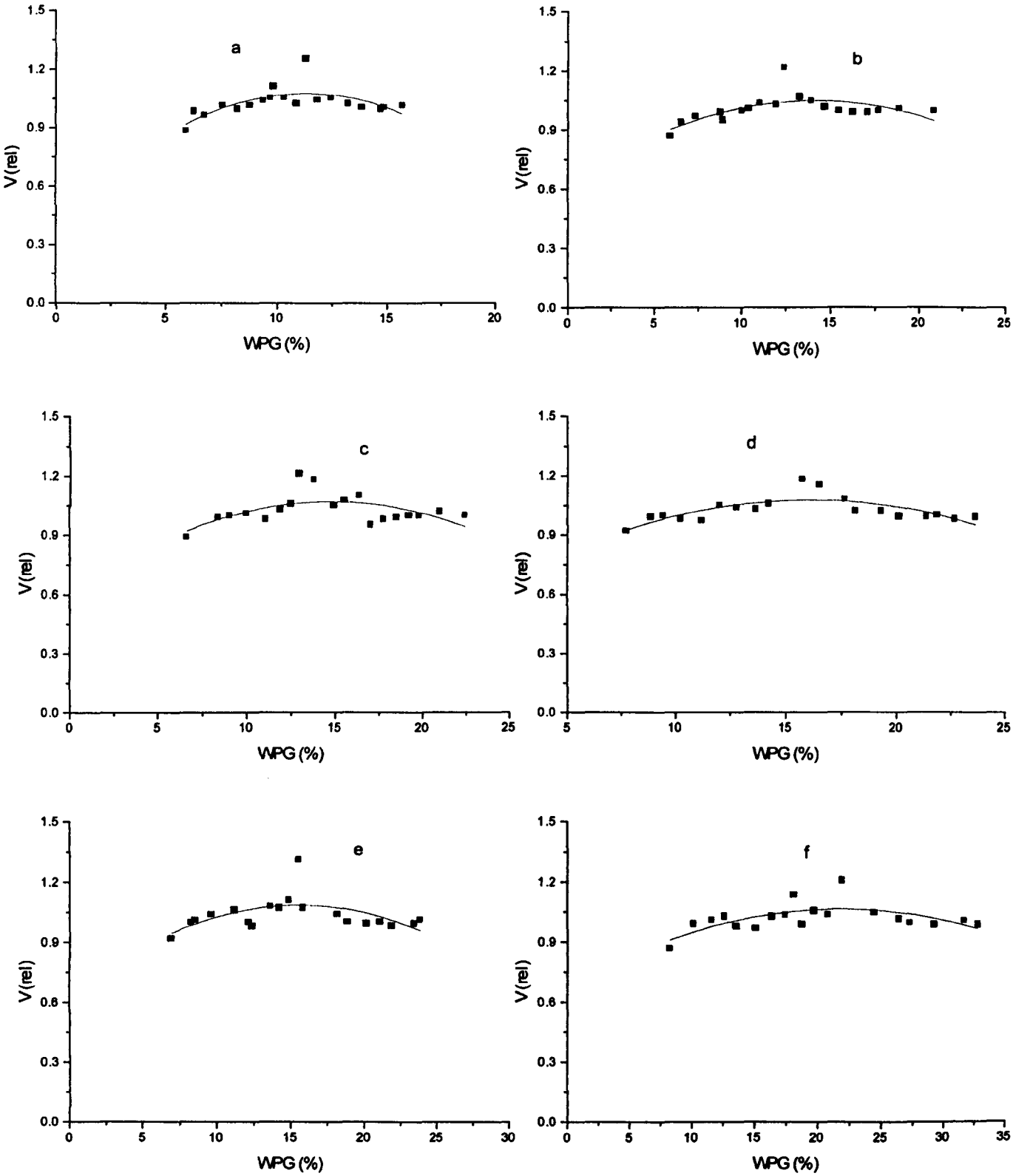


Figure 3.15: Relationship between ratio of theoretical volume and measured volume increase (V(rel)) and WPG of Scots pine samples modified with hexanoic anhydride at 60 ^{0}C (a), 70 ^{0}C (b), 80 ^{0}C (c), 90 ^{0}C (d), 100 ^{0}C (e), 110 ^{0}C (f).

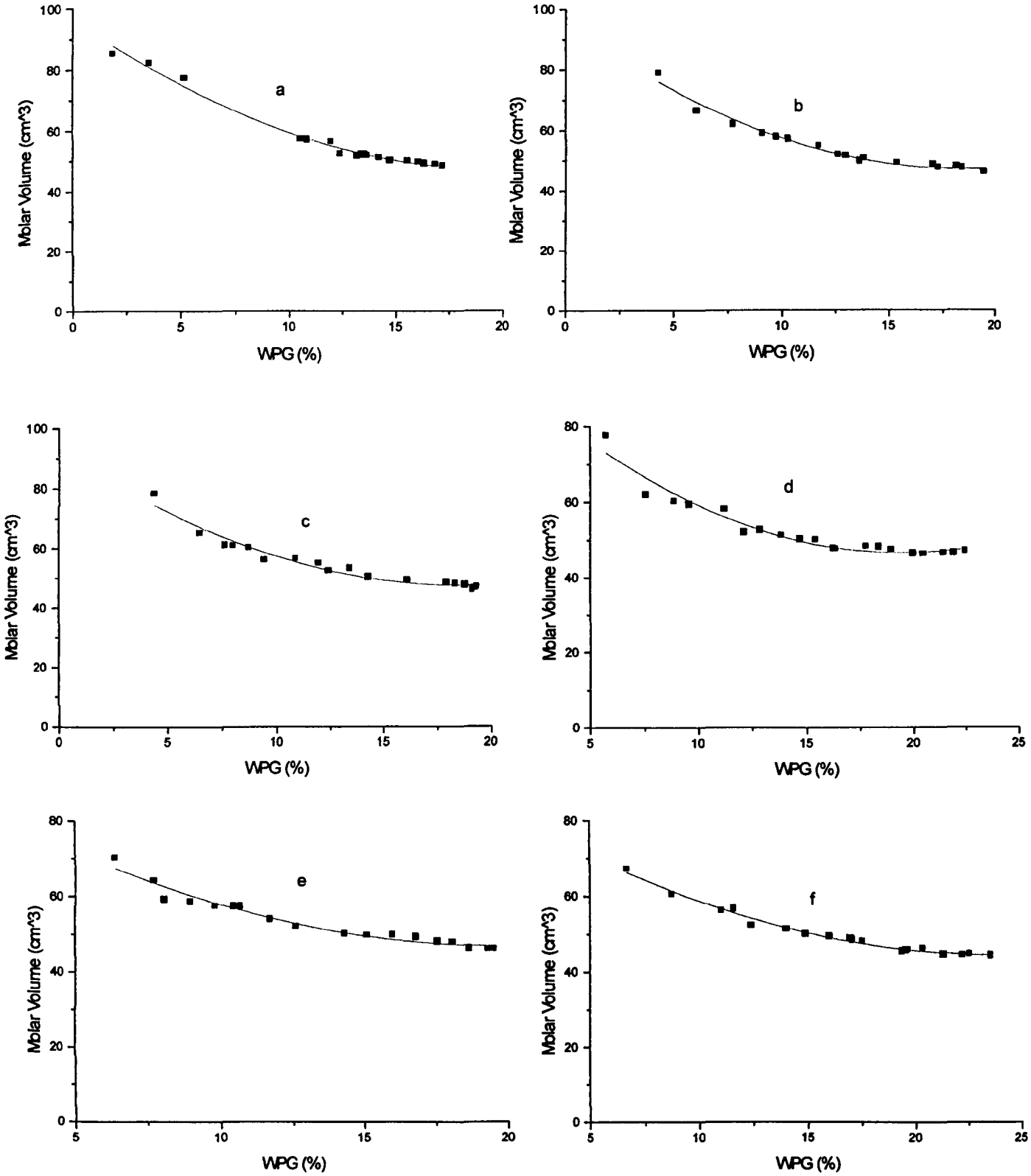


Figure 3.16: Variation in molar volume with WPG for Corsican pine samples modified with acetic anhydride at 60 ^{0}C (a), 70 ^{0}C (b), 80 ^{0}C (c), 90 ^{0}C (d), 100 ^{0}C (e), 110 ^{0}C (f).

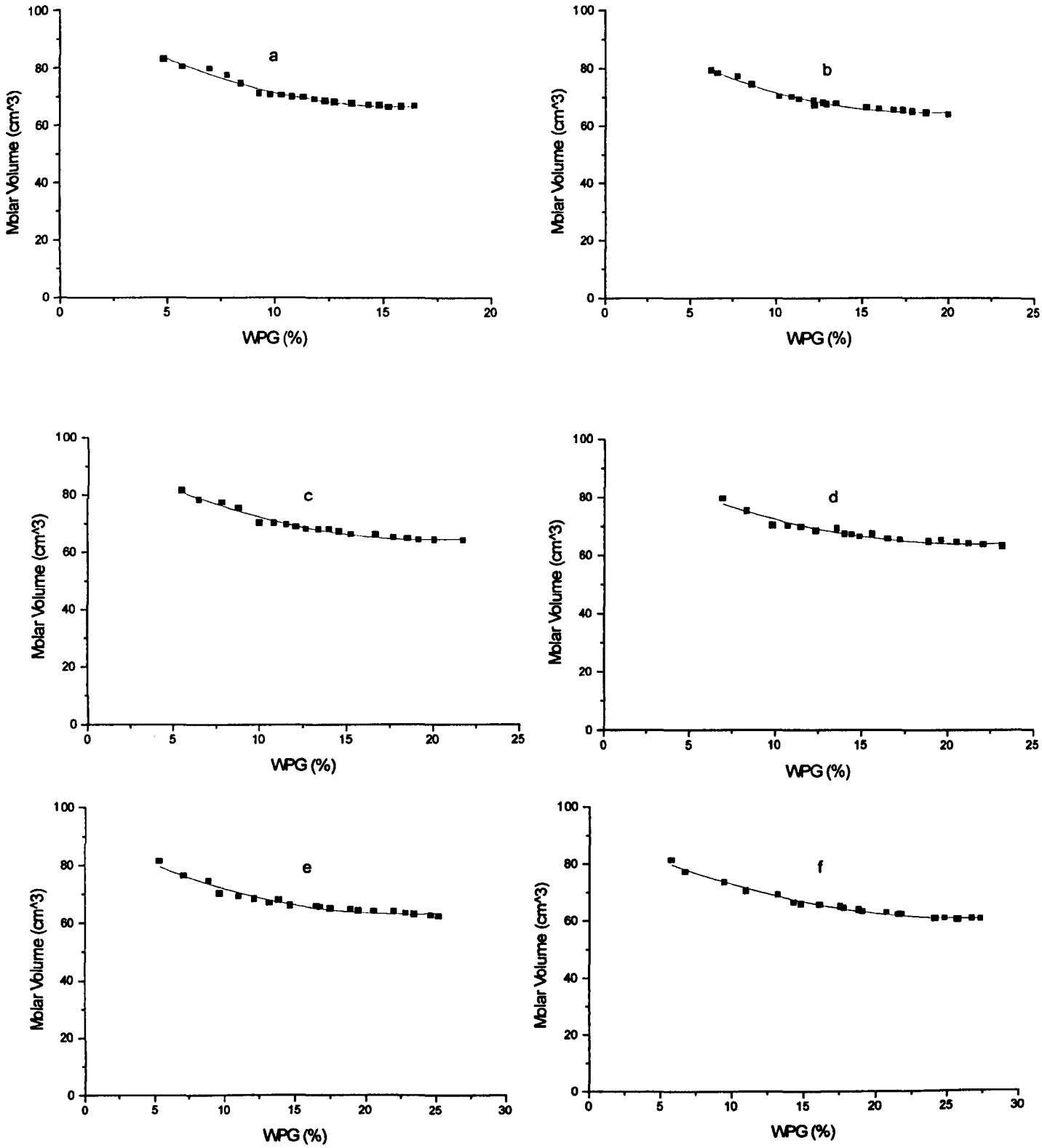


Figure 3.17: *Variation in molar volume with WPG for Corsican pine samples modified with propionic anhydride at 60 ^{0}C (a), 70 ^{0}C (b), 80 ^{0}C (c), 90 ^{0}C (d), 100 ^{0}C (e), 110 ^{0}C (f).*

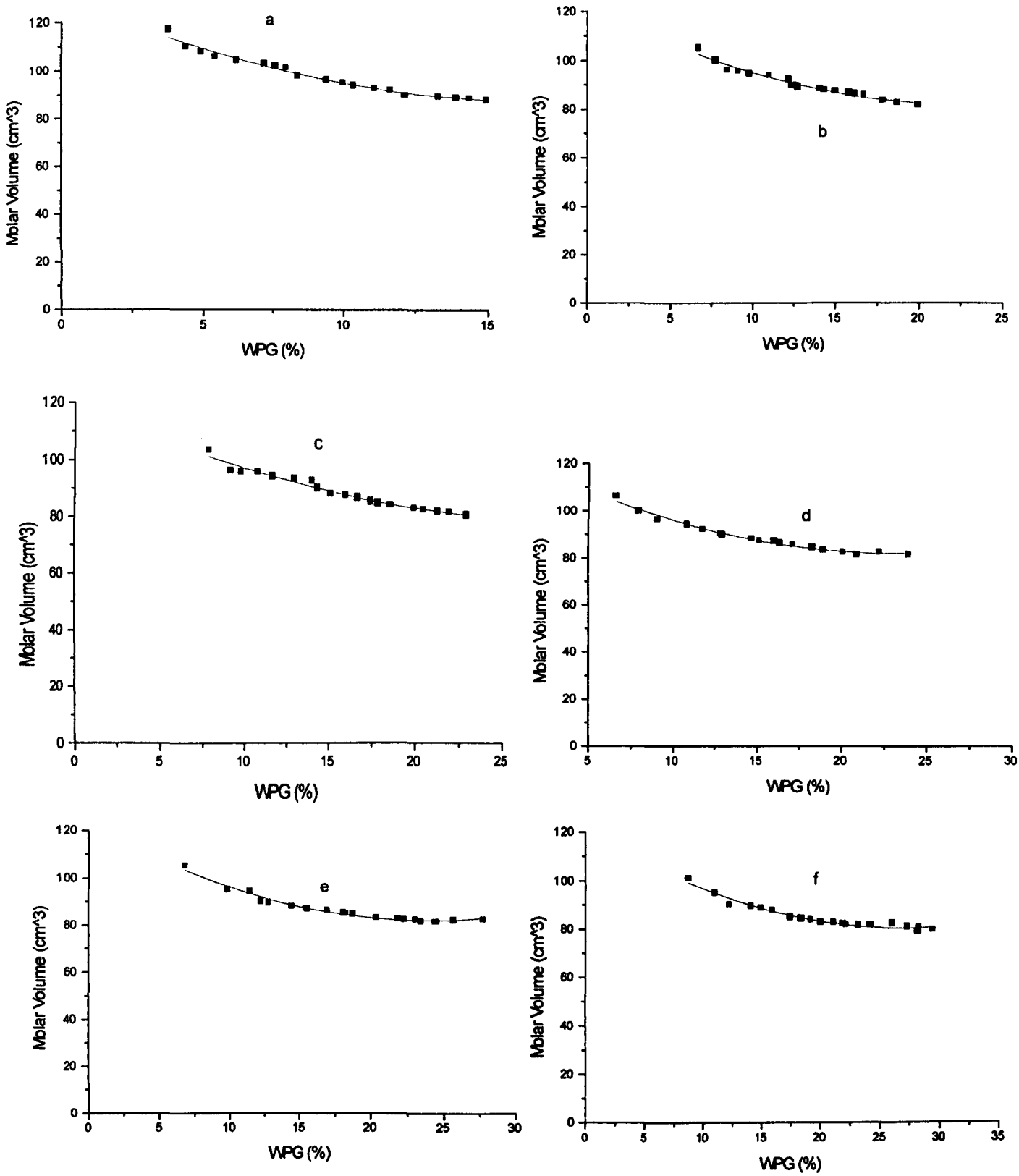


Figure 3.18: *Variation in molar volume with WPG for Corsican pine samples modified with butyric anhydride at 60 ^{0}C (a), 70 ^{0}C (b), 80 ^{0}C (c), 90 ^{0}C (d), 100 ^{0}C (e), 110 ^{0}C (f).*

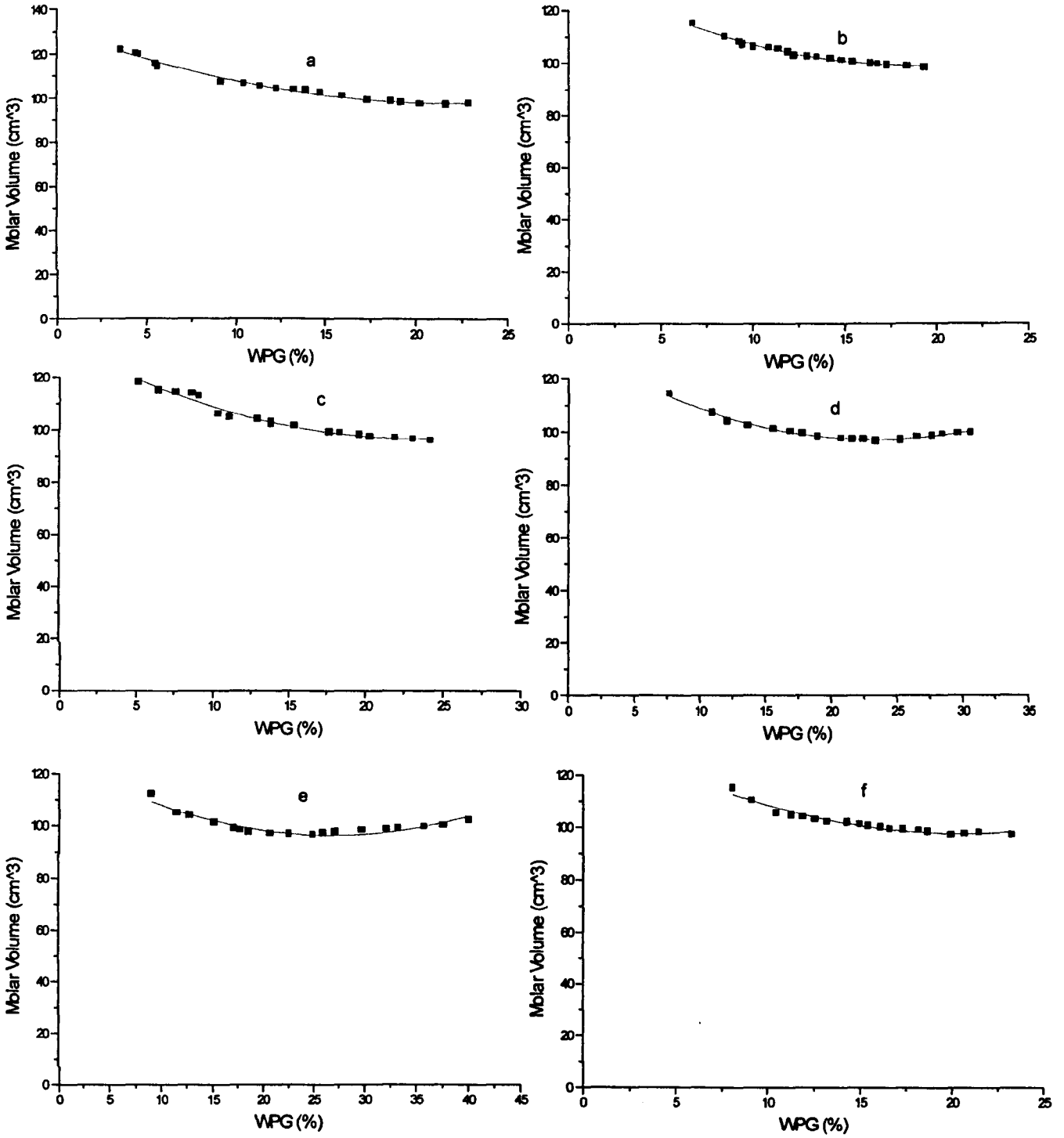


Figure 3.19: *Variation in molar volume with WPG for Corsican pine samples modified with valeric anhydride at 60 ^{0}C (a), 70 ^{0}C (b), 80 ^{0}C (c), 90 ^{0}C (d), 100 ^{0}C (e), 110 ^{0}C (f).*

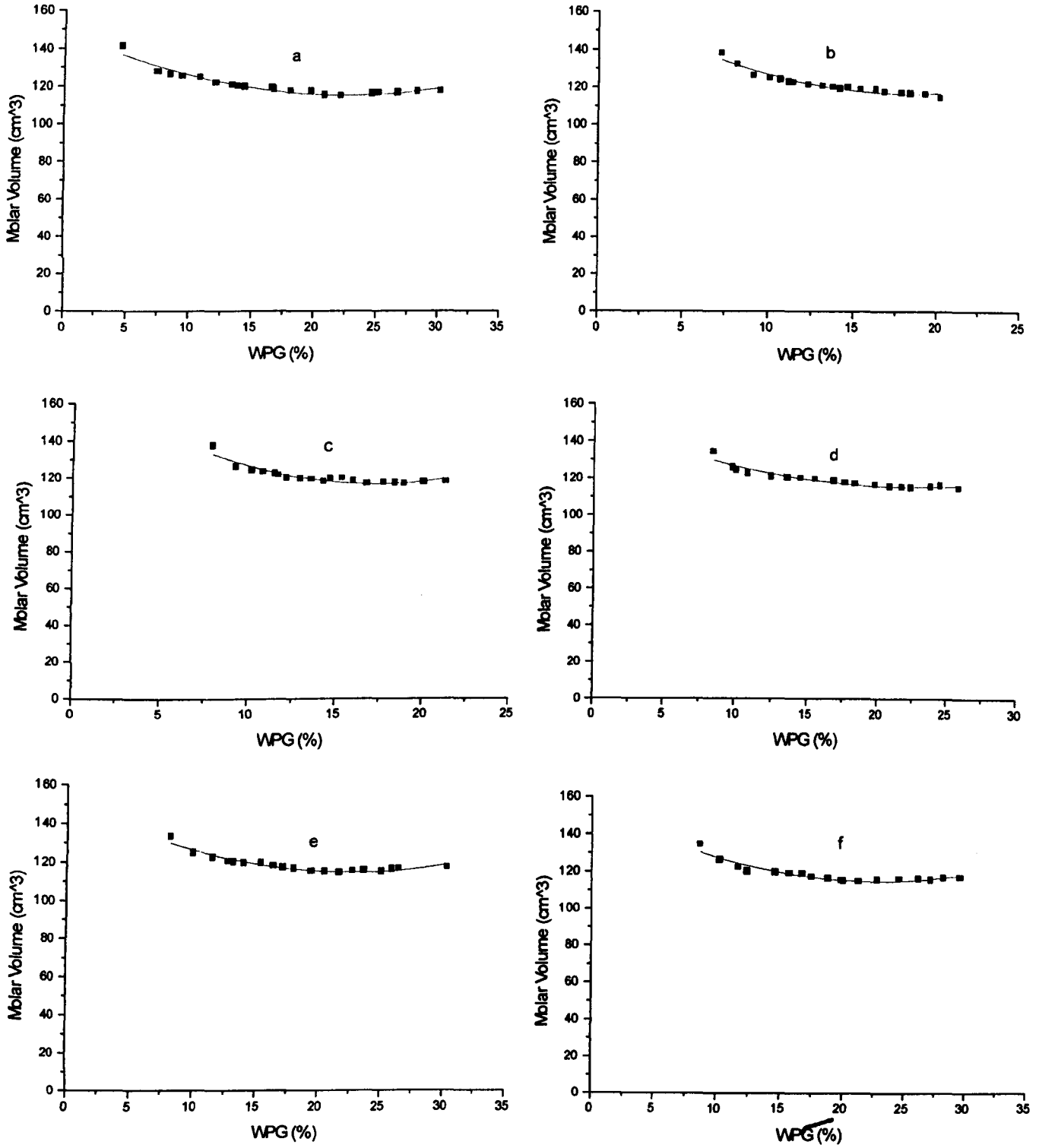


Figure 3.20: *Variation in molar volume with WPG for Corsican pine samples modified with hexanoic anhydride at 60 ^{0}C (a), 70 ^{0}C (b), 80 ^{0}C (c), 90 ^{0}C (d), 100 ^{0}C (e), 110 ^{0}C (f)*

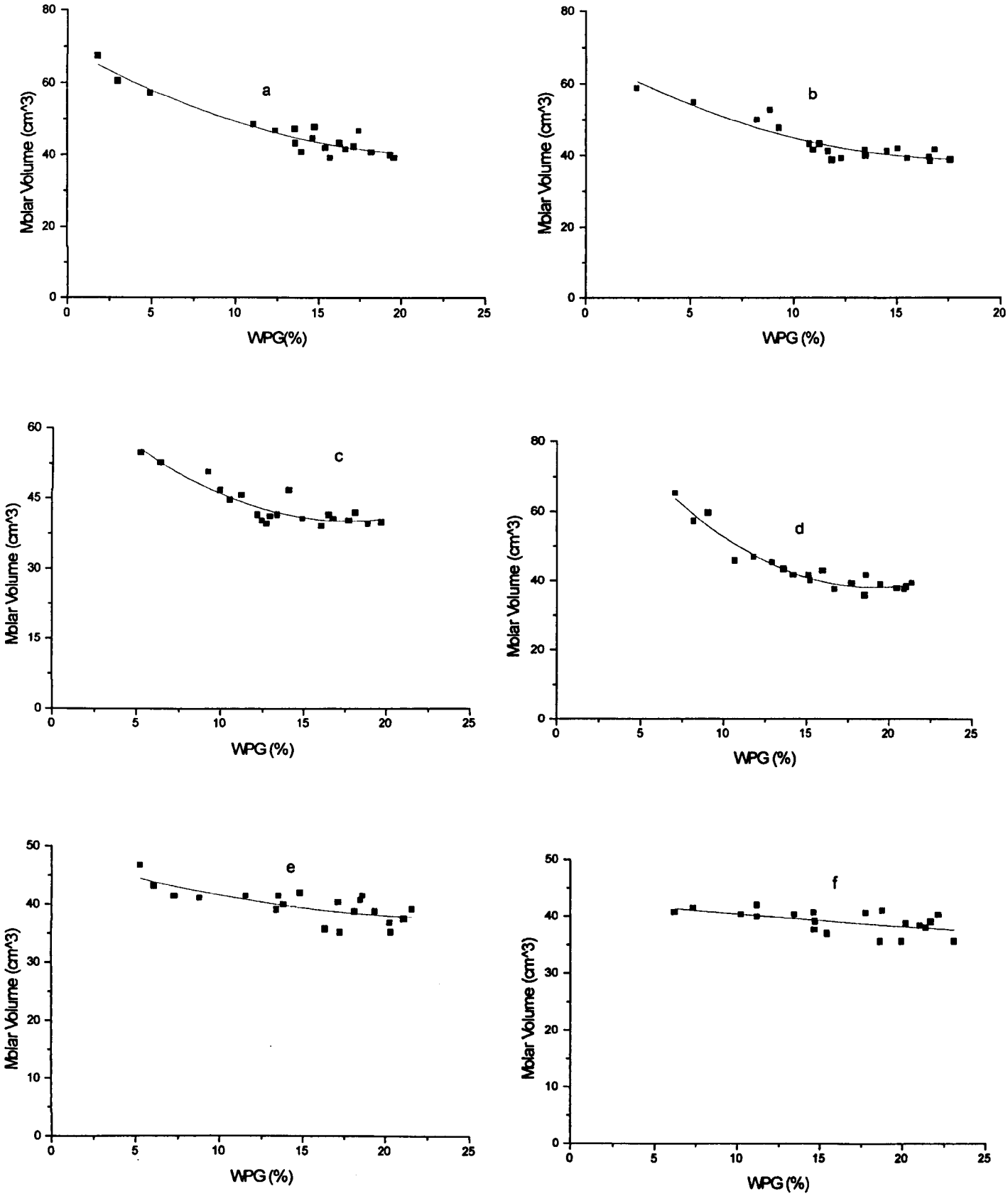


Figure 3.21: *Variation in molar volume with WPG for Scots pine samples modified with acetic anhydride at 60^{O} (a), 70^{O} (b), 80^{O} (c), 90^{O} (d), 100^{O} (e) and 110^{O} (f).*

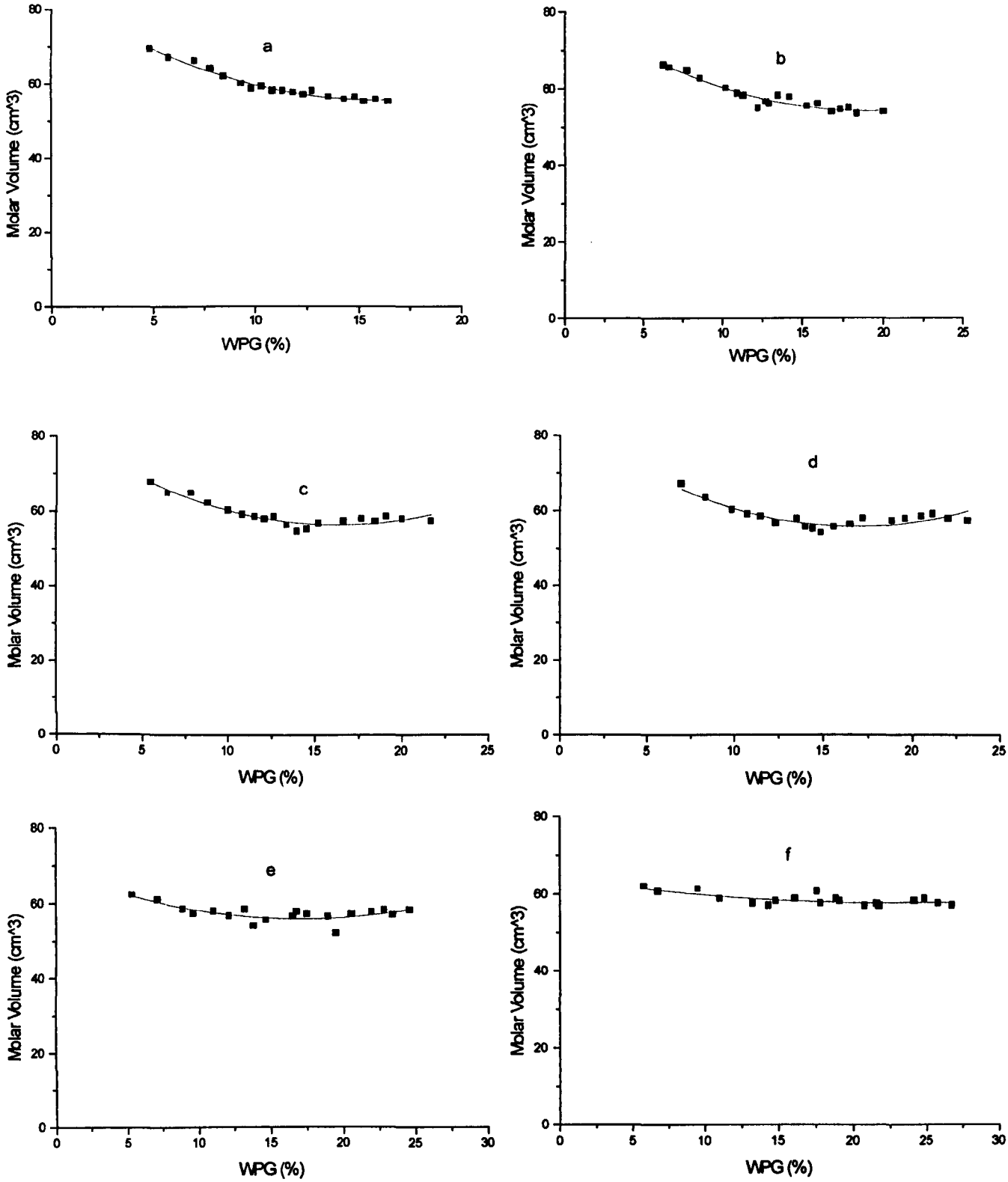


Figure 3.22: *Variation in molar volume with WPG for Scots pine samples modified with propionic anhydride at 60 ^{0}C (a), 70 ^{0}C (b), 80 ^{0}C (c), 90 ^{0}C (d), 100 ^{0}C (e), 110 ^{0}C (f).*

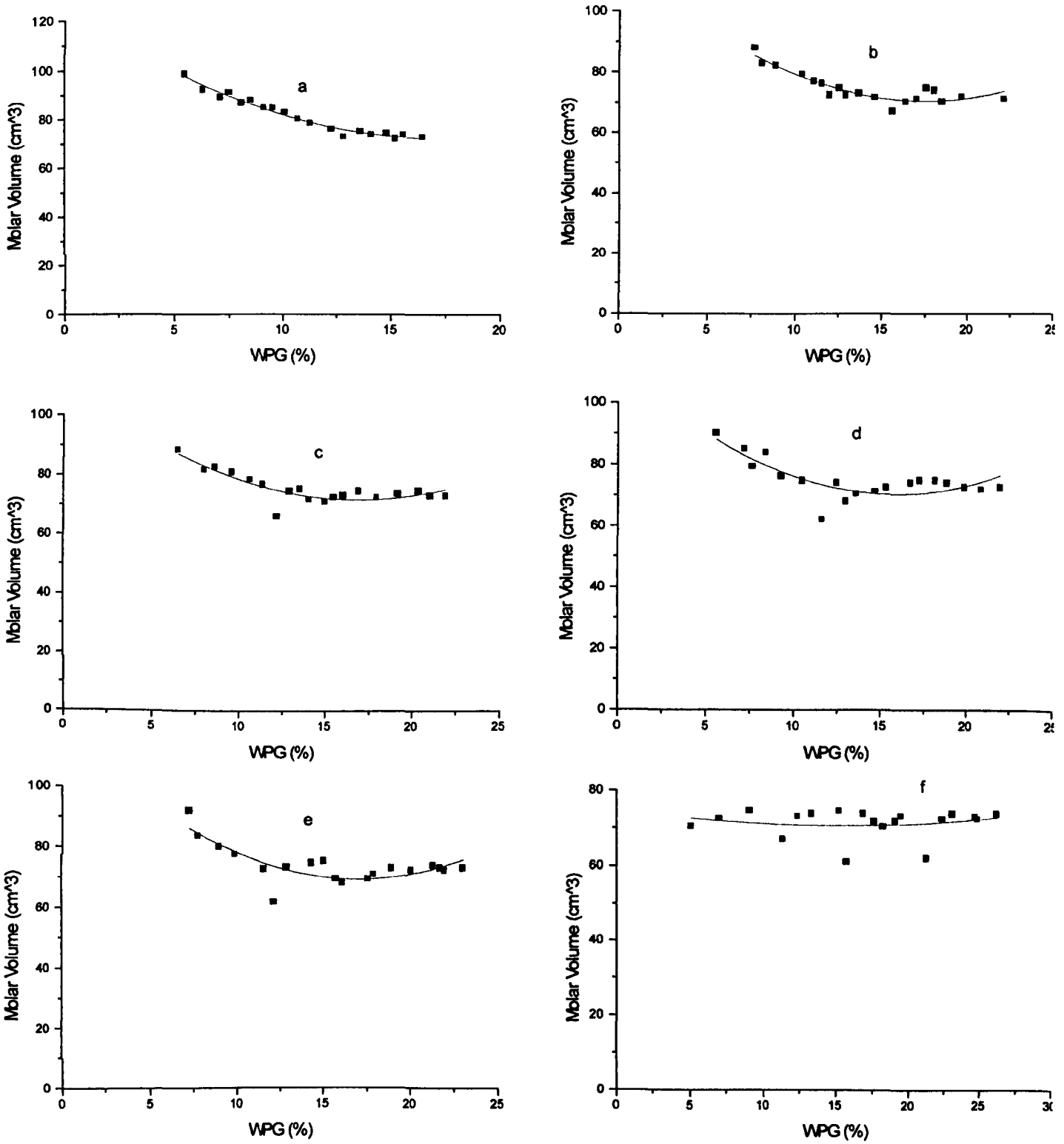


Figure 3.23: Variation in molar volume with WPG for Scots pine samples modified with butyric anhydride at 60 ^{0}C (a), 70 ^{0}C (b), 80 ^{0}C (c), 90 ^{0}C (d), 100 ^{0}C (e), 110 ^{0}C (f).

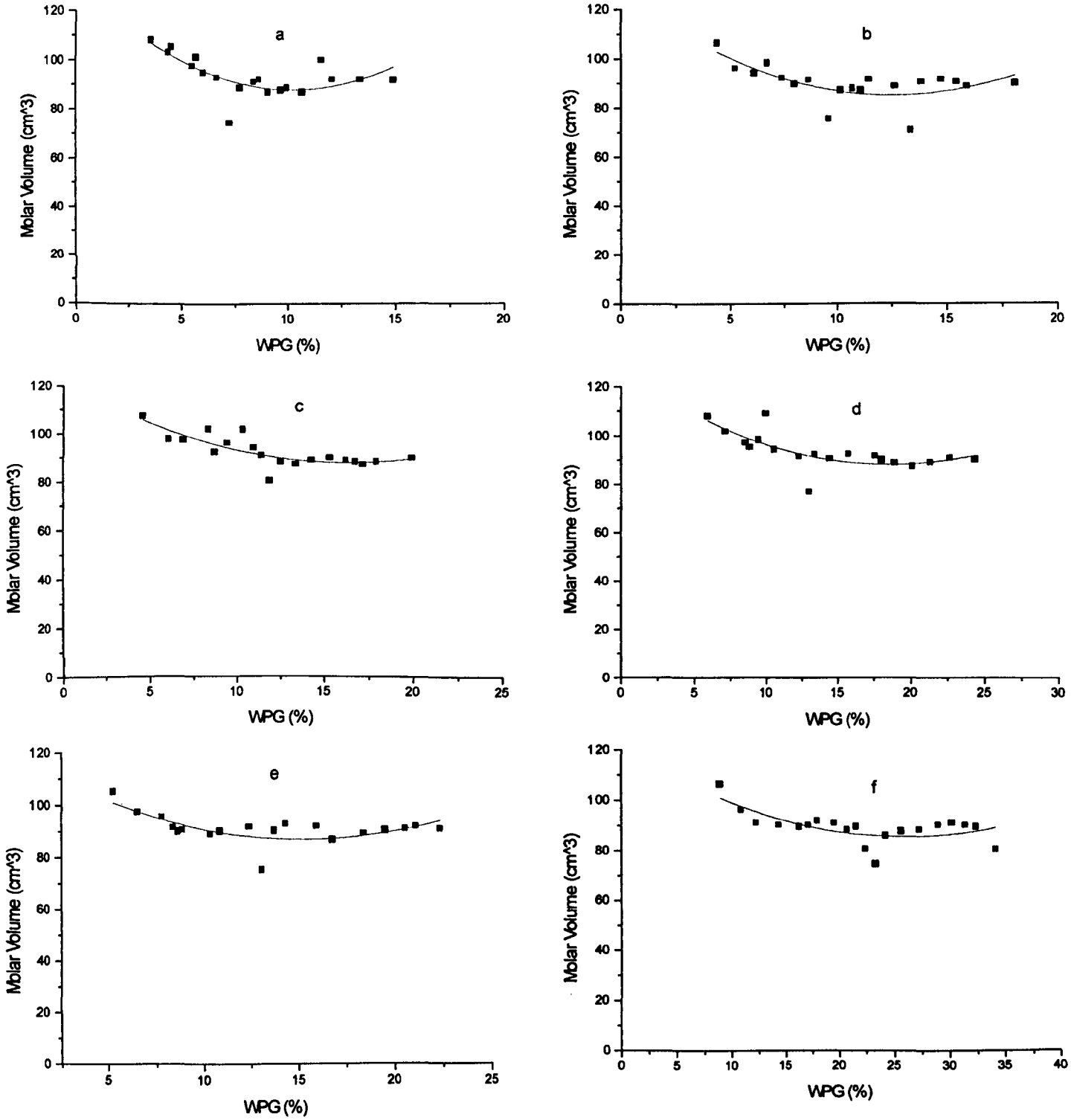


Figure 3.24: *Variation in molar volume with WPG for Scots pine samples modified with valeric anhydride at 60 ^{0}C (a), 70 ^{0}C (b), 80 ^{0}C (c), 90 ^{0}C (d), 100 ^{0}C (e), 110 ^{0}C (f).*

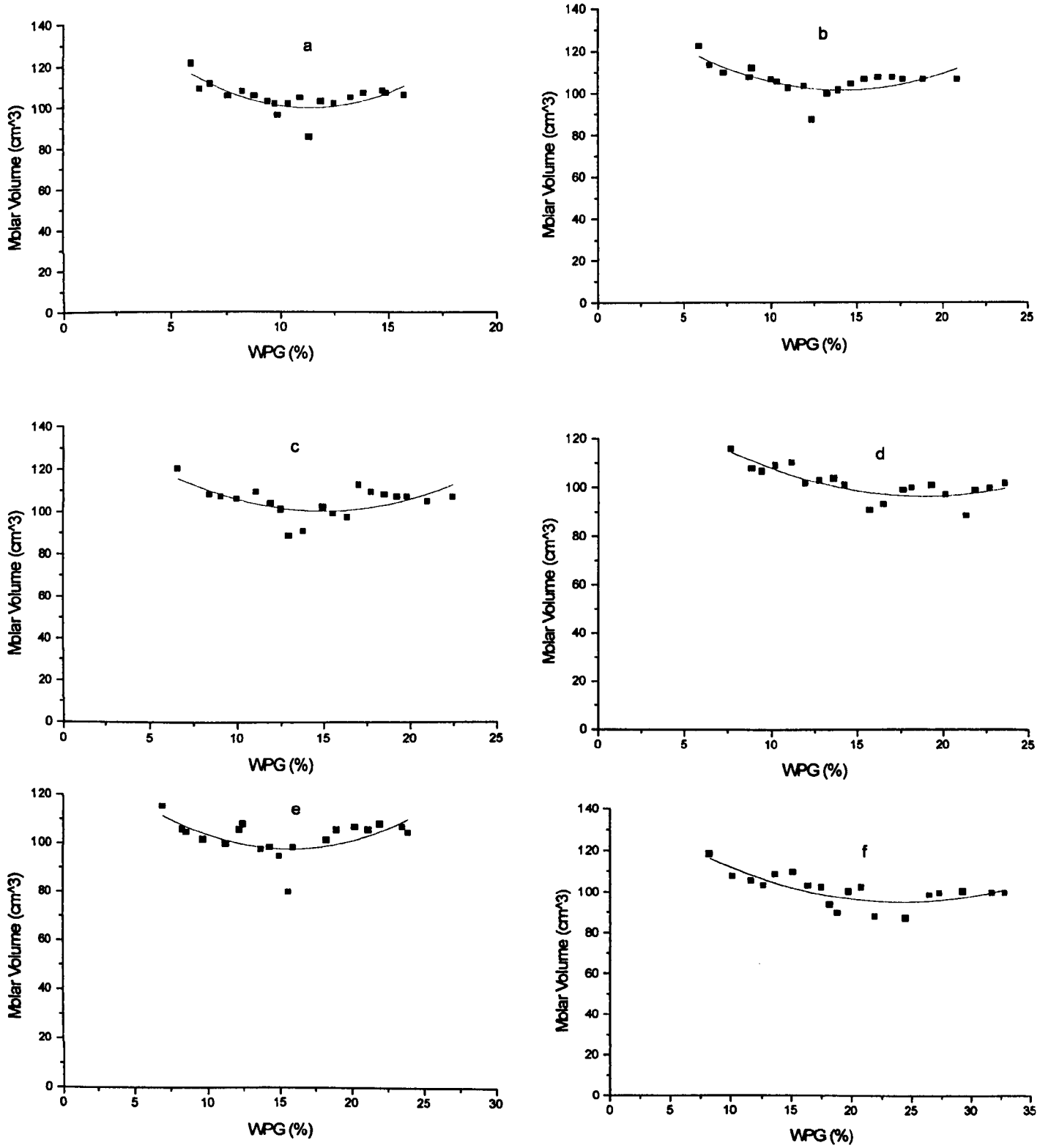


Figure 3.25: *Variation in molar volume with WPG for Scots pine samples modified with hexanoic anhydride at 60 ^{0}C (a), 70 ^{0}C (b), 80 ^{0}C (c), 90 ^{0}C (d), 100 ^{0}C (e), 110 ^{0}C (f)*

APPENDIX 4

Table 1.: *Corsican pine samples (solvent exchange dried samples (SED), with oven-dried samples in xylene (OD_1) and in the presence of acetic acid (OD_1)) modified with acetic anhydride at 100^{0}C.*

Time (sec)	SED	OD_1	OD_1
		WPG (%)	
0	0	0	0
300	1.1223	1.6571	0.5223
900	1.8852	2.4201	0.8921
1800	2.5333	3.276	1.139
2700	3.3252	3.8806	1.8922
3600	3.7523	4.5806	2.5568
4500	4.3225	5.0244	3.2525
5400	5.3355	4.9623	4.1225
6300	4.9522	6.0128	5.0122
7200	5.9222	5.8848	4.8862
8100	6.033	6.6104	5.2255
9000	5.8855	6.687	5.1211

Table 2: *Corsican pine samples (solvent exchange dried samples (SED), with oven-dried samples in xylene (OD_1) and in the presence of propionic acid (OD_1)) modified with propionic anhydride at 100^{0}C.*

Time (sec)	SED	OD_1	OD_1
		WPG (%)	
0	0	0	0
300	0.6588	1.7298	0.2681
900	0.9822	2.3688	0.4174
1800	1.2433	2.8405	0.4966
2700	2.1222	3.3423	0.4948
3600	2.6555	3.5436	0.6313
4500	3.6655	4.3839	0.5055
5400	3.3255	4.7217	0.1572
6300	4.4666	5.2201	0.546
7200	5.1255	5.5522	0.2422
8100	4.8862	6.0012	0.3835
9000	5.2222	6.3255	0.5381

Table 3: *Scots samples (solvent exchange dried samples (SED), with oven-dried samples in xylene (OD_1) and in the presence of acetic acid (OD_1)) modified with acetic anhydride at 100^0C.*

Time (sec)	SED	OD_1	OD_1
		WPG (%)	
0	0	0	0
300	0.3967	0.73	0.0118
900	1.1165	1.23	0.08178
1800	1.0329	1.83	0.11875
2700	1.6186	2.53	-0.0161
3600	2.2963	3.583	0.09645
4500	3.3584	4.291	0.12914
5400	3.6965	4.79	0.05799
6300	4.5711	5.168	0.06598
7200	5.9146	5.689	0.15082
8100	6.4655	5.803	0.06089
9000	6.7707	6.521	0.11246
9900	--	6.889	--

Table 4 *Corsican pine samples (solvent exchange dried samples (SED), with oven-dried samples in xylene (OD_1) and in the presence of propionic acid (OD_1)) modified with propionic anhydride at 100^0C.*

Time (sec)	SED	OD_1	OD_1
		WPG (%)	
0	0	0	0
300	0.4926	0.5821	0.1977
900	0.6144	1.0021	0.0171
1800	1.1907	1.8562	0.06749
2700	1.3297	2.3233	0.10436
3600	1.889	3.321	0.17266
4500	2.251	2.9901	-0.0532
5400	2.7742	3.8542	0.07686
6300	3.2927	4.688	0.06665
7200	4.0473	4.302	0.2171
8100	4.892	5.4433	0.14549
9000	4.562	5.7152	0.14857