Appendix A

Methane / Propane data

A.1 Experimental data

A.1.1 Rapid compression machine data

% N_2 / % Ar	p_i / bar	T_i / K	CR	p_C / bar	T_C / K	τ / ms
0/100	0.40	338	8.8	10.8	1058	13.8
0/100	0.40	338	9.0	10.8	1067	13.8
0/100	0.40	368	8.6	10.2	1124	2.6
0/100	0.40	368	8.8	10.6	1136	2.6

Table A.1: 90% CH_4 / 10% C_3H_8 oxidation at $\phi = 0.3$, $p_C = 10$ atm

% N_2 / % Ar	p_i / bar	T_i / K	CR	p_C / bar	T_C / K	τ / ms
40/60	0.90	368	9.1	21.1	976	16.4
40/60	0.90	368	9.2	21.4	980	15.4
0/100	0.73	307	9.1	21.1	988	11.9
0/100	0.73	307	9.1	20.8	987	12.6
0/100	0.70	293	9.2	20.8	955	55.0
0/100	0.75	338	9.2	21.6	1077	5.0
0/100	0.75	338	9.1	21.4	1074	5.1

Table A.2: 90% CH_4 / 10% C_3H_8 oxidation at $\phi = 0.3$, $p_C = 20$ atm

% N_2 / % Ar	p_i / bar	T_i / K	CR	p_C / bar	T_C / K	τ / ms
40/60	1.31	368	9.1	31.1	976	9.6
40/60	1.31	368	9.1	31.2	976	9.4
40/60	1.31	345	9.1	31.3	923	49.2
40/60	1.31	345	9.0	31.1	921	46.6
0/100	1.02	293	9.3	30.6	960	29.4
0/100	1.02	293	9.3	30.5	959	30.6
0/100	1.03	307	9.2	30.1	993	6.7
0/100	1.03	307	9.3	30.4	996	6.7
0/100	1.06	338	9.1	30.0	1072	2.9
0/100	1.06	338	8.9	29.8	1064	3.0
0/100	1.14	338	8.8	30.9	1057	3.0
0/100	1.14	338	8.9	31.5	1064	3.1

Table A.3: 90% CH_4 / 10% C_3H_8 oxidation at $\phi = 0.3$, $p_C = 30$ atm

% N_2 / % Ar	p_i / bar	T_i / K	CR	p_C / bar	T_C / K	τ / ms
0/100	0.36	338	9.2	9.8	1033	15.5
0/100	0.36	338	9.0	9.6	1026	17.9
0/100	0.40	368	9.0	10.4	1099	3.1
0/100	0.40	368	8.9	10.4	1096	3.3

Table A.4: 90% CH_4 / 10% C_3H_8 oxidation at $\phi = 0.5$, $p_C = 10$ atm

% N_2 / % Ar	p_i / bar	T_i / K	CR	p_C / bar	T_C / K	τ / ms
50/50	0.86	338	9.6	20.9	876	–
50/50	0.86	338	9.6	20.9	875	–
50/50	0.86	353	9.5	20.4	904	103.0
50/50	0.86	353	9.5	20.4	904	94.0
0/100	0.76	291	9.3	21.9	916	95.7
0/100	0.76	291	9.2	21.7	913	96.8
0/100	0.70	307	9.2	19.8	955	31.7
0/100	0.70	307	9.2	19.6	953	27.2
0/100	0.72	338	9.2	20.0	103	4.2
0/100	0.72	338	9.2	20.1	103	4.3

Table A.5: 90% CH_4 / 10% C_3H_8 oxidation at $\phi = 0.5$, $p_C = 20$ atm

% N_2 / % Ar	p_i / bar	T_i / K	CR	p_C / bar	T_C / K	τ / ms
50/50	1.60	322	9.6	39.5	842	–
50/50	1.60	322	9.6	39.6	842	–
50/50	1.61	338	9.6	39.4	877	64.8
50/50	1.60	338	9.6	39.4	876	69.0
50/50	1.61	353	9.6	39.1	909	21.6
50/50	1.61	353	9.6	38.9	907	20.6

Table A.6: 90% CH_4 / 10% C_3H_8 oxidation at $\phi = 0.5$, $p_C = 40$ atm

% N_2 / % Ar	p_i / bar	T_i / K	CR	p_C / bar	T_C / K	τ / ms
0/100	0.37	307	9.4	10.0	892	–
0/100	0.37	322	9.4	9.9	924	–
0/100	0.37	322	9.3	9.6	919	–
0/100	0.38	338	9.5	10.2	965	61.9
0/100	0.38	338	9.5	10.2	966	67.0
0/100	0.38	353	9.4	10.0	997	26.8
0/100	0.38	353	9.4	10.0	995	26.3
0/100	0.39	368	9.4	9.9	1028	13.8
0/100	0.39	368	9.4	10.0	1028	14.2

Table A.7: 90% CH_4 / 10% C_3H_8 oxidation at $\phi = 1.0$, $p_C = 10$ atm

% N_2 / % Ar	p_i / bar	T_i / K	CR	p_C / bar	T_C / K	τ / ms
0/100	0.72	290	9.7	20.3	862	–
0/100	0.72	290	9.7	20.3	862	–
0/100	0.72	307	9.6	20.1	900	143.3
0/100	0.72	307	9.6	20.0	899	143.0
0/100	0.72	322	9.6	19.8	934	33.8
0/100	0.72	322	9.6	19.9	935	33.6
0/100	0.72	338	9.5	19.2	965	14.6
0/100	0.72	338	9.6	19.5	969	13.6
0/100	0.73	353	9.6	19.7	1004	7.1
0/100	0.73	353	9.7	19.9	1007	7.0

Table A.8: 90% CH_4 / 10% C_3H_8 oxidation at $\phi = 1.0$, $p_C = 20$ atm

% N_2 / % Ar	p_i / bar	T_i / K	CR	p_C / bar	T_C / K	τ / ms
0/100	1.23	307	9.6	30.6	807	199.4
0/100	1.23	307	9.7	30.8	808	216.0
0/100	1.23	322	9.6	30.2	836	66.0
0/100	1.23	322	9.6	30.3	836	92.2
0/100	1.23	338	9.6	29.9	867	43.6
0/100	1.23	338	9.6	29.8	866	44.3

Table A.9: 90% CH_4 / 10% C_3H_8 oxidation at $\phi = 2.0$, $p_C = 30$ atm

% N_2 / % Ar	p_i / bar	T_i / K	CR	p_C / bar	T_C / K	τ / ms
0/100	1.29	310	9.7	30.4	755	320.0
0/100	1.29	310	9.8	30.6	755	220.0
0/100	1.30	322	9.8	30.5	783	175.5
0/100	1.30	322	9.8	30.6	783	169.9
0/100	1.30	338	9.6	29.5	806	140.2
0/100	1.30	338	9.7	29.7	807	131.0
0/100	1.31	353	9.7	29.6	833	53.7
0/100	1.31	353	9.6	29.3	831	55.0
0/100	1.31	368	9.7	29.2	859	22.0
0/100	1.31	368	9.7	29.2	858	21.5
0/100	1.30	313	9.6	29.9	761	218.0
0/100	1.30	313	9.7	30.4	764	181.7
0/100	1.30	313	9.7	30.4	764	195.6
0/100	1.31	329	9.7	30.0	792	136.0
0/100	1.31	329	9.7	30.0	792	153.3
0/100	1.31	345	9.7	29.6	819	104.7
0/100	1.31	345	9.7	29.6	819	120.0

Table A.10: 90% CH_4 / 10% C_3H_8 oxidation at $\phi = 3.0$, $p_C = 30$ atm

% N_2 / % Ar	p_i / bar	T_i / K	CR	p_C / bar	T_C / K	τ / ms
50/50	1.15	293	9.7	29.5	786	–
50/50	1.15	293	9.7	29.5	786	–
50/50	1.16	333	9.8	29.5	885	–
50/50	1.16	333	9.7	29.5	885	–
20/80	1.16	322	9.2	30.1	934	–
20/80	1.16	322	9.2	30.2	935	–
0/100	0.97	293	9.5	29.8	958	30.4
0/100	0.97	293	9.5	29.7	958	29.3
0/100	0.98	307	9.3	29.5	1009	11.9
0/100	0.98	307	9.5	30.0	1014	11.0
0/100	0.94	322	9.6	28.9	1045	5.7
0/100	0.94	322	9.5	28.5	1044	5.9
0/100	0.95	343	9.5	28.5	1100	2.4
0/100	0.95	343	9.6	28.8	1104	2.2

Table A.11: 70% CH_4 / 30% C_3H_8 oxidation at $\phi = 0.3$, $p_C = 30$ atm

% N_2 / % Ar	p_i / bar	T_i / K	CR	p_C / bar	T_C / K	τ / ms
50/50	1.55	293	9.7	39.5	789	–
50/50	1.55	293	9.7	39.6	790	–
50/50	1.57	333	9.7	39.3	881	–
50/50	1.57	333	9.7	39.3	880	–
20/80	1.56	307	9.3	41.6	900	–
20/80	1.56	307	9.3	41.6	899	–
20/80	1.55	322	9.2	40.7	936	22.8
20/80	1.55	322	9.3	41.0	938	25.0
0/100	1.25	293	9.6	38.3	963	16.8
0/100	1.25	293	9.6	38.3	963	17.9
0/100	1.26	312	9.5	38.4	1001	7.8
0/100	1.26	312	9.5	38.4	1001	7.8
0/100	1.25	293	9.5	38.5	961	14.6
0/100	1.25	293	9.4	37.9	957	16.4
0/100	1.26	307	9.5	38.5	1001	6.3
0/100	1.26	307	9.4	38.0	997	6.7
0/100	1.27	322	9.5	38.4	1042	3.7
0/100	1.27	322	9.4	38.0	1039	3.3
0/100	1.31	343	9.5	39.1	1099	1.6

Table A.12: 70% CH_4 / 30% C_3H_8 oxidation at $\phi = 0.3$, $p_C = 40$ atm

% N_2 / % Ar	p_i / bar	T_i / K	CR	p_C / bar	T_C / K	τ / ms
0/100	0.37	322	9.1	10.0	979	47.6
0/100	0.37	322	9.1	9.9	977	51.4
0/100	0.37	368	9.1	9.8	1015	14.5
0/100	0.37	368	9.2	9.9	1020	14.4
0/100	0.37	353	8.8	9.3	1039	6.4
0/100	0.37	353	8.9	9.5	1045	6.6
0/100	0.37	368	9.0	9.7	1087	3.0
0/100	0.37	368	9.0	9.7	1088	3.0

Table A.13: 70% CH_4 / 30% C_3H_8 oxidation at $\phi = 0.5$, $p_C = 10$ atm

% N_2 / % Ar	p_i / bar	T_i / K	CR	p_C / bar	T_C / K	τ / ms
50/50	0.82	368	9.6	19.6	930	47.3
50/50	0.82	368	9.6	19.6	930	48.0
0/100	0.71	291	9.3	20.2	903	71.0
0/100	0.71	291	9.3	20.4	905	70.4
0/100	0.72	322	9.3	20.1	985	9.9
0/100	0.72	322	9.3	20.3	987	9.7
0/100	0.72	338	9.4	20.4	1033	3.9
0/100	0.72	338	9.4	20.4	1033	4.0
0/100	0.72	353	9.4	20.2	1071	2.5
0/100	0.72	353	9.3	20.0	1066	2.4

Table A.14: 70% CH_4 / 30% C_3H_8 oxidation at $\phi = 0.5$, $p_C = 20$ atm

% N_2 / % Ar	p_i / bar	T_i / K	CR	p_C / bar	T_C / K	τ / ms
50/50	1.67	290	9.6	41.7	763	156.6
50/50	1.67	290	9.6	41.3	761	150.3
50/50	1.60	322	9.7	39.7	836	72.9
50/50	1.60	322	9.7	39.5	834	70.4
50/50	1.60	338	9.7	39.9	867	47.0
50/50	1.62	338	9.6	39.4	869	44.7
50/50	1.62	368	9.7	39.2	934	16.2
50/50	1.62	368	9.6	38.9	932	15.8

Table A.15: 70% CH_4 / 30% C_3H_8 oxidation at $\phi = 0.5$, $p_C = 40$ atm

% N_2 / % Ar	p_i / bar	T_i / K	CR	p_C / bar	T_C / K	τ / ms
40/60	0.42	373	9.6	9.8	924	56.5
40/60	0.42	373	9.5	9.8	917	53.4
40/60	0.42	373	9.4	9.6	919	54.2
20/80	0.42	373	9.1	9.5	959	16.8
20/80	0.42	373	9.3	9.7	960	16.0
20/80	0.42	373	9.3	9.7	961	15.9

Table A.16: 70% CH_4 / 30% C_3H_8 oxidation at $\phi = 1.0$, $p_C = 10$ atm

% N_2 / % Ar	p_i / bar	T_i / K	CR	p_C / bar	T_C / K	τ / ms
50/50	0.88	378	9.6	19.7	900	60.2
50/50	0.88	378	9.5	19.4	896	67.4
20/80	0.79	352	9.7	19.8	909	55.9
20/80	0.79	352	9.7	19.8	909	53.4
20/80	0.79	352	9.7	19.9	910	51.4
20/80	0.81	378	9.5	19.6	969	5.2
20/80	0.81	378	9.6	19.7	971	5.5
20/80	0.82	378	9.5	19.7	970	5.1

Table A.17: 70% CH_4 / 30% C_3H_8 oxidation at $\phi = 1.0$, $p_C = 20$ atm

% N_2 / % Ar	p_i / bar	T_i / K	CR	p_C / bar	T_C / K	τ / ms
50/50	1.22	291	9.9	30.2	735	284.0
50/50	1.23	291	9.9	30.0	734	281.0
50/50	1.23	291	9.9	30.1	735	275.0
50/50	1.23	311	9.8	29.8	773	116.4
50/50	1.24	311	9.8	29.7	772	121.7
50/50	1.25	332	10.	30.3	838	100.7
50/50	1.25	332	10.	30.2	838	102.9
50/50	1.25	346	9.9	29.8	844	86.8
50/50	1.26	346	9.9	29.7	843	98.9
50/50	1.27	362	9.8	29.5	884	38.9
50/50	1.27	362	9.8	29.4	884	34.8
40/60	1.19	291	9.8	29.6	751	164.5
40/60	1.19	291	9.8	29.5	752	165.2
40/60	1.20	291	9.8	29.5	753	162.1
40/60	1.20	311	9.8	29.7	794	117.2
40/60	1.20	311	9.8	29.6	793	115.3
40/60	1.20	311	9.8	29.6	793	115.1
40/60	1.20	346	10.	30.1	873	67.5
40/40	1.20	346	10.	30.1	873	67.8
40/40	1.20	346	10.	30.2	873	68.1
40/60	1.25	377	9.8	29.4	925	7.0
40/60	1.25	377	9.8	29.5	926	6.0
40/60	1.25	377	9.8	29.5	926	6.8
20/80	1.15	294	9.7	30.1	800	116.4
20/80	1.16	294	9.7	30.0	799	121.1
20/80	1.15	294	9.7	30.1	800	125.3
20/80	1.18	346	9.6	29.5	908	34.6
20/80	1.19	346	9.7	29.7	909	36.4
20/80	1.19	346	9.7	29.7	909	37.1

Table A.18: 70% CH_4 / 30% C_3H_8 oxidation at $\phi = 1.0$, $p_C = 30$ atm

% N_2 / % Ar	p_i / bar	T_i / K	CR	p_C / bar	T_C / K	τ / ms
75/25	1.39	322	9.8	29.1	696	–
75/25	1.43	322	9.7	29.6	694	–
75/25	1.49	322	9.7	30.5	693	–
75/25	1.41	338	10.0	30.0	727	82.2
75/25	1.44	338	10.1	31.0	729	73.2
75/25	1.42	338	10.1	30.4	729	79.2
75/25	1.42	341	10.0	30.1	733	70.0
75/25	1.42	341	10.1	30.5	735	67.2
75/25	1.42	341	10.1	30.4	734	67.2
75/25	1.47	353	9.7	29.9	747	68.3
75/25	1.48	353	9.8	30.1	747	67.3
75/25	1.48	353	9.7	29.7	745	68.4
75/25	1.44	353	9.9	29.7	750	52.3
75/25	1.44	353	9.9	29.7	749	52.4
75/25	1.49	368	9.8	30.4	774	58.5
75/25	1.50	368	9.8	30.3	773	57.4
75/25	1.49	368	9.7	30.1	772	58.8
75/25	1.51	368	9.7	30.0	770	50.0
75/25	1.46	368	9.8	29.7	773	56.2
75/25	1.47	368	9.8	29.8	773	55.1

Table A.19: 70% CH_4 / 30% C_3H_8 oxidation at $\phi = 2.0$, $p_C = 30$ atm

% Ar	p_i / bar	T_i / K	CR	p_C / bar	T_C / K	τ / ms
100	1.26	293	9.7	30.7	750	57.7
100	1.24	293	9.7	30.3	750	60.1
100	1.24	293	9.8	30.8	753	57.7
100	1.23	307	9.6	29.6	775	42.9
100	1.24	307	9.5	29.2	772	43.6
100	1.24	307	9.7	29.9	777	42.6
100	1.24	322	9.9	30.6	811	46.3
100	1.24	322	9.8	30.3	809	42.8
100	1.24	322	9.8	30.1	808	42.7
100	1.24	338	9.9	30.0	840	38.0
100	1.24	338	9.9	30.0	840	38.1
100	1.24	338	9.9	29.9	839	37.4
100	1.25	353	9.7	29.2	862	19.5
100	1.28	353	9.8	30.4	866	18.0
100	1.28	353	9.8	30.4	866	18.1
100	1.28	368	9.8	30.0	891	8.8
100	1.28	368	9.7	29.8	890	7.8

Table A.20: 70% CH_4 / 30% C_3H_8 oxidation at $\phi = 2.0$, $p_C = 30$ atm

% N_2 / % Ar	p_i / bar	T_i / K	CR	p_C / bar	T_C / K	τ / ms
40/60	0.97	347	10.0	20.6	740	129.5
40/60	0.97	347	10.0	20.6	740	132.1
40/60	0.99	378	9.8	20.0	789	79.9
40/60	0.99	378	9.8	20.2	790	79.4
40/60	1.00	378	9.9	20.3	791	79.0
20/80	0.91	333	9.6	19.1	742	108.6
20/80	0.91	333	9.6	19.3	742	110.6
20/80	0.95	343	9.6	19.8	754	78.4
20/80	0.96	343	9.6	20.0	755	78.1
20/80	0.96	343	9.6	19.9	754	78.9
20/80	0.96	347	9.6	19.9	759	73.4
20/80	0.96	347	9.5	19.6	756	74.6
20/80	0.95	353	9.9	20.4	777	70.2
20/80	0.99	353	9.6	20.3	769	70.8
20/80	0.99	363	9.5	20.2	785	75.7
20/80	0.99	363	9.5	20.0	783	76.0
20/80	0.99	363	9.4	19.9	782	76.5
20/80	1.01	373	9.4	19.9	802	59.2
20/80	1.04	373	9.5	20.9	805	59.3
20/80	1.01	373	9.5	20.2	804	59.4

Table A.21: 70% CH_4 / 30% C_3H_8 oxidation at $\phi = 3.0$, $p_C = 20$ atm

% N_2 / % Ar	p_i / bar	T_i / K	CR	p_C / bar	T_C / K	τ / ms
20/80	1.02	378	9.5	20.3	812	49.7
20/80	1.02	378	9.5	20.2	811	50.3
20/80	1.02	378	9.5	20.4	812	50.3
0/100	0.95	321	9.5	20.7	742	108.0
0/100	0.93	321	9.6	20.4	743	107.6
0/100	0.93	321	9.6	20.3	743	107.4
0/100	0.94	338	9.6	20.3	771	69.8
0/100	0.94	338	9.6	20.4	771	69.7
0/100	0.94	338	9.6	20.2	770	70.4
0/100	0.91	347	9.6	19.5	785	79.9
0/100	0.91	347	9.6	19.5	785	80.2
0/100	0.97	360	9.5	20.4	806	66.4
0/100	0.97	360	9.5	20.4	805	66.4
0/100	0.97	360	9.5	20.4	806	67.0
0/100	0.97	378	9.3	19.5	828	20.3
0/100	0.97	378	9.3	19.6	830	22.9
0/100	0.98	378	9.3	19.7	829	22.0
0/100	0.97	373	9.3	19.7	822	34.6
0/100	0.98	373	9.2	19.6	819	36.3
0/100	0.98	373	9.2	19.5	820	35.4

Table A.22: 70% CH_4 / 30% C_3H_8 oxidation at $\phi = 3.0$, $p_C = 20$ atm

% N_2 / % Ar	p_i / bar	T_i / K	CR	p_C / bar	T_C / K	τ / ms
40/60	1.45	378	10.0	30.0	795	28.1
40/60	1.45	378	10.0	30.3	795	25.8
40/60	1.45	378	10.0	30.0	794	28.5
40/60	1.37	296	10.1	30.5	664	–
40/60	1.36	296	10.0	29.8	661	–
40/60	1.36	297	10.0	29.8	663	–
40/60	1.45	347	10.1	31.1	742	84.8
40/60	1.42	347	10.1	30.4	743	81.5
40/60	1.42	347	10.1	30.6	742	86.4
40/60	1.36	312	10.2	30.2	691	–
40/60	1.36	312	10.2	30.2	691	–
40/60	1.36	312	10.2	30.2	691	–
20/80	1.36	333	9.8	29.3	742	54.9
20/80	1.38	333	9.9	29.9	743	51.6
20/80	1.38	333	9.8	29.8	742	51.0
20/80	1.44	343	9.9	31.0	760	34.1
20/80	1.41	343	9.9	30.6	761	34.3
20/80	1.42	353	9.8	29.8	773	27.6
20/80	1.41	353	9.8	30.0	774	28.1
20/80	1.41	353	9.7	29.7	773	29.6
20/80	1.42	363	9.7	29.2	786	29.1
20/80	1.45	363	9.7	29.9	787	28.3

Table A.23: 70% CH_4 / 30% C_3H_8 oxidation at $\phi = 3.0$, $p_C = 30$ atm

% N_2 / % Ar	p_i / bar	T_i / K	CR	p_C / bar	T_C / K	τ / ms
20/80	1.48	373	9.6	30.1	802	22.0
20/80	1.47	373	9.6	29.8	801	22.7
20/80	1.47	373	9.6	29.9	801	23.6
20/80	1.48	378	9.5	29.7	808	21.2
20/80	1.48	378	9.6	30.1	810	21.2
0/100	1.17	298	10.0	27.4	713	–
0/100	1.24	298	10.0	29.1	713	–
0/100	1.24	298	10.0	29.2	713	–
0/100	1.33	312	10.0	30.9	737	144.2
0/100	1.33	312	9.9	30.6	737	145.5
0/100	1.34	312	9.9	30.7	734	154.0
0/100	1.35	347	10.1	30.8	797	29.3
0/100	1.36	347	10.1	30.9	797	30.8
0/100	1.35	347	10.0	30.5	795	30.2
0/100	1.46	363	9.5	30.8	811	22.1
0/100	1.45	363	9.6	30.6	811	22.4
0/100	1.48	373	9.6	30.7	826	14.6
0/100	1.46	373	9.3	29.9	824	15.1
0/100	1.46	378	9.5	30.0	833	10.8
0/100	1.47	378	9.5	30.2	833	10.9
0/100	1.45	378	9.4	29.6	831	18.6
0/100	1.46	378	9.4	29.9	831	19.6

Table A.24: 70% CH_4 / 30% C_3H_8 oxidation at $\phi = 3.0$, $p_C = 30$ atm