Supplemental Content for:

Autoignition of n-decane/n-butylbenzene/n-propylcyclohexane mixtures and the effects of the exhaust gas recirculation

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- Typical experimental pressure and emission signals.
- Included for each experiment presented in the manuscript: experimental conditions (equivalence ratio, initial compositions, temperatures – K, pressures – bar) and ignition delay times.

Figure 1S. Typical experimental pressure and emission signals as function of time. Ternary + EGR mixture at stoichiometric conditions in 99% argon, initial temperature and pressure equal to 1502 K and 10.1 bar, respectively.

Table 1S. Mixture compositions in mole fractions (balance of argon); temperature (K), pressure (bar), and ignition delay times (μs).

	Φ	n-C ₁₀ H ₂₂	n-C ₉ H ₁₈	n-C ₁₀ H ₁₄	O ₂	H ₂ O	CO ₂	N ₂	T (K)	P (bar)	τ (μs)
ternary (~99% argon)	1.5	3.80E-4	2.85E-4	2.85E-4	9.06E-3	-	-	-	1346	9.97	997.2
									1402	10.19	653.6
									1434	10.32	407.6
									1474	10.56	309.2
									1514	10.38	225.2
									1534	10.84	201.0
									1570	10.15	122.8
									1595	10.32	71.1
									1596	11.07	89.4
									1650	10.05	46.0
									1741	10.47	23.4
	1.0	2.70E-4	1.95E-4	1.96E-4	9.34E-3	-	-	-	1307	9.83	852.4
									1349	10.14	718.4
									1399	10.05	376.0
									1435	10.82	279.6
									1449	9.34	188.7
									1451	11.24	250.8
									1516	10.52	99.5
									1536	9.27	63.9
									1557	9.78	64.2
									1616	10.11	38.3
									1656	10.15	24.1
									1697	10.37	16.2
	0.5	1.35E-4	1.02E-4	1.02E-4	9.68E-3	-	-	-	1265	10.21	1021.2
									1309	10.57	526.0
									1328	9.53	317.6
									1330	10.25	474.6
									1349	9.73	253.2
									1351	10.16	307.6
									1424	10.61	148.0
									1432	10.33	103.4
									1453	10.26	74.1
									1509	10.58	54.6
									1545	10.26	37.1
									1594	10.07	17.8
	0.2	5.5E-5	4.1E-5	4.0E-5	9.87E-3	-	-	-	1261	10.29	844.0
									1298	10.39	382.0
									1342	10.32	157.8
									1347	10.75	204.0
									1386	10.33	83.2
									1412	10.88	81.0
									1419	10.10	63.3
									1422	10.52	90.0
									1470	10.08	51.0
									1519	10.35	24.5
									1528	10.00	24.3
									1591	9.94	13.5

	Φ	n-C ₁₀ H ₂₂	n-C ₉ H ₁₈	n-C ₁₀ H ₁₄	O ₂	H ₂ O	CO ₂	N ₂	T (K)	P (bar)	τ (μ s)
ternary + EGR (~99% argon)	1.5	2.47E-4	1.83E-4	1.84E-4	5.84E-3	1.53E-4	2.74E-4	3.12E-3	1407	10.13	717.4
									1428	10.38	449.6
									1476	9.98	332.8
									1482	10.71	338.0
									1502	10.62	252.8
									1564	10.12	142.8
									1585	9.88	112.5
									1637	11.40	62.8
									1650	9.94	53.3
									1684	9.68	40.6
									1744	9.92	25.4
	1.0	1.68E-4	1.26E-4	1.26E-4	6.00E-3	1.53E-4	2.75E-4	3.14E-3	1317	10.10	879.6
									1355	10.40	786.4
									1410	10.72	406.4
									1410	11.02	376.4
									1468	10.82	214.4
									1493	10.47	191.8
									1502	10.10	159.3
									1555	10.24	71.7
									1608	10.21	52.3
									1644	10.16	37.6
									1702	10.32	22.6
									1745	10.14	13.8
	0.5	8.7E-5	6.5E-5	6.5E-5	6.25E-3	1.53E-4	2.74E-4	3.12E-3	1306	10.43	802.0
									1343	10.37	417.6
									1352	10.77	363.6
									1407	10.62	166.2
									1411	9.91	182.4
									1436	10.33	190.4
									1494	10.12	66.7
									1508	10.79	50.8
									1514	9.91	51.2
									1520	10.63	60.3
									1571	10.08	29.4
									1648	9.76	22.2
	0.2	3.5E-5	2.7E-5	2.7E-5	6.38E-3	1.52E-4	2.79E-4	3.11E-3	1263	10.29	998.8
									1270	10.13	977.2
									1342	10.88	354.8
									1349	10.47	284.0
									1363	10.33	295.4
									1381	11.73	166.6
									1433	10.37	80.4
									1447	10.29	67.7
									1508	10.75	35.3
									1516	9.38	40.8
									1546	10.37	29.6
									1621	10.21	20.2

	Φ	n-C ₁₀ H ₂₂	n-C ₉ H ₁₈	n-C ₁₀ H ₁₄	O ₂	H ₂ O	CO ₂	N ₂	T (K)	P (bar)	τ (μ s)
n-decane + n-butylbenzene (~99% argon)	1.5	5.57E-4	-	3.74E-4	9.24E-3	-	-	-	1334	10.51	1056.8
									1382	10.67	624.4
									1415	10.69	514.8
									1450	10.84	351.0
									1491	9.93	156.1
									1505	10.77	200.6
									1511	9.76	159.4
									1580	10.28	106.5
									1608	10.58	58.1
									1621	10.16	48.1
									1627	10.67	51.1
									1691	10.43	28.3
	1.0	3.84E-4	-	2.55E-4	9.38E-3	-	-	-	1319	10.21	833.6
									1382	9.24	328.4
									1386	10.76	342.4
									1412	10.70	302.8
									1422	9.71	148.0
									1433	10.11	166.1
									1522	10.70	81.8
									1539	9.68	57.9
									1564	10.59	45.7
									1627	10.17	28.4
									1677	10.45	16.2
	0.5	1.98E-4	-	1.32E-4	9.67E-3	-	-	-	1298	10.67	576.0
									1330	10.60	342.8
									1349	10.55	306.2
									1398	10.86	163.8
									1406	10.65	149.0
									1430	11.25	126.4
									1438	10.41	110.2
									1465	10.41	70.1
									1504	10.52	48.4
									1521	10.03	44.4
									1557	8.91	27.2
	0.2	8.0E-5	-	5.3E-5	1.01E-2	-	-	-	1260	10.60	663.20
									1263	9.80	368.80
									1293	10.77	354.00
									1302	10.19	293.80
									1376	10.18	146.40
									1383	10.89	118.60
									1440	10.38	64.25
									1490	10.27	37.66
		8.1E-5	-	5.5E-5	9.89E-3	-	-	-	1330	10.20	191.60
									1377	10.12	108.58
									1446	10.77	65.08
									1501	10.16	22.80

	Φ	n-C ₁₀ H ₂₂	n-C ₉ H ₁₈	n-C ₁₀ H ₁₄	O ₂	H ₂ O	CO ₂	N ₂	T (K)	P (bar)	τ (μ s)
n-decane + n-propylcyclohexane (~99% argon)	1.5	5.60E-4	3.70E-4	-	9.07E-3	-	-	-	1359	10.19	750.0
									1402	10.57	532.4
									1420	10.79	408.8
									1433	10.58	351.2
									1465	10.45	193.7
									1513	10.72	154.8
									1536	10.71	123.6
									1560	10.39	69.7
									1563	12.30	94.6
									1639	10.59	48.5
									1656	10.10	32.2
									1747	10.50	15.5
	1.0	3.83E-4	2.63E-4	-	9.38E-3	-	-	-	1267	10.78	1238.8
									1347	10.59	516.8
									1357	11.07	534.8
									1403	10.74	269.4
									1440	10.55	166.0
									1490	10.76	96.2
									1536	11.04	60.4
									1539	11.30	70.4
									1539	10.61	54.9
									1566	10.46	43.2
									1579	9.99	38.1
									1633	10.17	23.8
	0.5	1.98E-4	1.35E-4	-	9.74E-3	-	-	-	1262	10.64	1003.2
									1300	10.84	446.6
									1327	10.82	371.0
									1363	10.69	186.6
									1406	10.65	113.8
									1467	10.77	94.8
									1503	10.53	47.8
									1603	11.01	17.6
		2.00E-4	1.30E-4	-	9.92E-3	-	-	-	1461	10.30	57.4
									1521	10.42	30.9
									1529	10.36	28.9
									1535	10.48	23.2
	0.2	8.1E-5	5.4E-5	-	9.87E-3	-	-	-	1259	10.45	482.3
									1318	10.30	370.3
									1351	10.68	189.7
									1366	11.01	151.9
									1383	10.89	93.1
									1424	10.20	73.8
									1430	12.16	73.3
									1435	9.13	77.4
									1440	11.66	61.6
									1479	9.80	34.4
									1582	10.60	15.8

	Φ	n-C ₁₀ H ₂₂	n-C ₉ H ₁₈	n-C ₁₀ H ₁₄	O ₂	H ₂ O	CO ₂	N ₂	T (K)	P (bar)	τ (μ s)
n-butylbenzene (~99% argon)	1.5	-	-	1.01E-3	9.12E-3	-	-	-	1462	11.73	485.8
				9.90E-4	8.98E-3				1471	11.30	354.8
				9.90E-4	8.98E-3				1525	11.05	220.2
				1.00E-3	9.12E-3				1533	10.75	239.0
				9.90E-4	8.97E-3				1560	10.92	186.0
				9.90E-4	8.97E-3				1576	10.21	187.7
				1.00E-3	9.12E-3				1578	10.68	145.0
				9.50E-4	8.67E-3				1583	11.13	159.2
				1.00E-3	9.12E-3				1610	10.27	97.1
				9.90E-4	8.97E-3				1623	10.23	90.8
				9.90E-4	8.98E-3				1715	10.80	46.4
				9.90E-4	8.97E-3				1762	10.90	36.2
	1.0	-	-	8.30E-4	1.10E-2	-	-	-	1432	11.03	465.5
				7.20E-4	1.06E-2				1448	10.95	345.7
				7.20E-4	1.06E-2				1474	11.16	253.2
				8.30E-4	1.10E-2				1493	11.16	224.9
				7.00E-4	9.35E-3				1496	11.23	220.0
				7.00E-4	9.35E-3				1517	11.31	185.2
				6.90E-4	9.31E-3				1535	11.44	167.3
				6.90E-4	9.31E-3				1548	11.48	145.9
				8.60E-4	1.07E-2				1573	10.83	98.0
				8.60E-4	1.07E-2				1584	11.82	110.1
				6.87E-4	9.24E-3				1593	10.29	110.3
				7.75E-4	9.60E-3				1594	11.43	96.1
				7.75E-4	9.60E-3				1617	11.25	90.7
				6.87E-4	9.24E-3				1622	10.94	76.3
	0.5	-	-	3.57E-4	9.61E-3	-	-	-	1403	1074	280.3
				3.57E-4	9.61E-3				1416	1064	238.0
				3.54E-4	9.65E-3				1462	1066	151.5
				3.60E-4	9.56E-3				1465	1079	177.4
				3.60E-4	9.64E-3				1479	1144	141.8
				3.60E-4	9.64E-3				1494	1095	106.6
				3.60E-4	9.65E-3				1496	1132	90.0
				3.60E-4	9.65E-3				1500	1156	95.1
				3.60E-4	9.57E-3				1541	1109	90.0
				3.57E-4	9.61E-3				1561	1178	59.1
				3.54E-4	9.65E-3				1570	1150	57.2
				3.60E-4	9.65E-3				1614	1148	40.2
				3.60E-4	9.57E-3				1629	1117	37.9
				3.60E-4	9.56E-3				1645	1217	39.2
	0.2	-	-	1.46E-4	9.86E-3	-	-	-	1359	10.58	286.4
									1366	10.07	207.8
									1454	10.54	128.5
									1468	10.04	90.4
									1502	11.12	72.2
									1640	10.46	37.1
									1689	10.23	27.2

		-	-	1.47E-4	9.86E-3	-	-	-	1319	10.84	462.4
									1364	11.22	327.2
									1404	10.24	196.0
									1412	10.16	123.6
									1531	10.04	62.1
									1561	10.18	59.3
									1595	10.34	34.4
									1748	10.52	22.0

	Φ	n-C ₁₀ H ₂₂	n-C ₉ H ₁₈	n-C ₁₀ H ₁₄	O ₂	H ₂ O	CO ₂	N ₂	T (K)	P (bar)	τ (μ s)
n-butylbenzene (~99.5% argon)	1.5	-	-	4.99 E-4	4.63E-3	-	-	-	1390	19.47	1018.4
									1439	20.18	824.8
									1550	19.87	286.2
		-	-	5.01E-4	4.53E-3	-	-	-	1456	19.34	468.6
									1500	19.79	337.8
									1536	18.83	196.5
									1603	18.70	80.2
		-	-	5.00E-4	4.60E-3	-	-	-	1689	19.15	43.91
									1696	18.71	45.50
									1724	18.15	27.58
	1.0	-	-	3.45E-4	4.70E-3	-	-	-	1400	19.26	611.2
									1434	19.31	352.0
									1583	18.60	62.0
									1586	19.60	76.8
									1681	18.39	34.1
									1685	19.28	37.1
		-	-	3.44E-4	4.71E-3	-	-	-	1760	19.01	20.6
									1392	19.91	631.2
									1480	18.56	219.0
									1571	19.81	93.8
	0.5	-	-	1.79E-4	4.85E-3	-	-	-	1441	19.45	184.2
									1463	20.92	158.2
									1493	18.74	83.0
									1496	19.77	100.5
									1564	19.21	49.6
		-	-	1.79E-4	4.87E-3	-	-	-	1404	20.39	284.0
									1420	19.88	174.6
		-	-	1.81E-4	4.78E-3	-	-	-	1314	18.73	821.6
									1364	19.38	450.0
									1589	19.19	37.8
	0.2	-	-	7.5E-5	4.84E-3	-	-	-	1272	19.06	649.2
									1360	19.82	300.8
									1392	19.90	253.6
									1416	19.73	160.8
		-	-	7.7E-5	4.95E-3	-	-	-	1334	19.82	380.8
									1467	20.25	92.3
									1472	20.06	64.8
									1481	19.36	76.7
									1526	19.25	62.6
									1635	19.97	24.2

	Φ	n-C ₁₀ H ₂₂	n-C ₉ H ₁₈	n-C ₁₀ H ₁₄	O ₂	H ₂ O	CO ₂	N ₂	T (K)	P (bar)	τ (μ s)
n-butylbenzene (~98.6%/~97.2%/~93.2% argon for $\Phi = 1.0/0.5/0.2$, respectively)	1.0	-	-	1.00E-3	1.33E-2	-	-	-	1414	10.35	468.2
									1526	11.05	160.8
									1541	10.48	143.0
		-	-	9.76E-4	1.32E-2	-	-	-	1366	10.36	763.6
									1417	11.34	431.6
									1474	10.33	266.5
									1603	10.77	62.8
									1629	10.74	52.4
									1676	10.46	40.3
	0.5	-	-	1.00E-3	2.70E-2	-	-	-	1271	10.30	725.2
									1337	11.01	295.8
									1360	10.48	282.6
									1365	11.22	262.8
									1388	11.45	182.7
									1431	10.80	130.9
									1494	10.85	69.3
									1555	10.81	31.8
									1568	10.18	38.6
									1583	9.93	29.5
	0.2	-	-	9.97E-4	6.74E-2	-	-	-	1222	10.77	579.6
									1232	10.56	497.6
									1241	10.37	401.6
									1290	11.01	241.6
									1329	10.77	173.8
									1333	11.06	187.4
									1345	10.82	121.2
									1360	10.66	107.2
									1397	10.80	64.4
									1462	10.96	36.8

	Φ	n-C ₁₀ H ₂₂	n-C ₉ H ₁₈	n-C ₁₀ H ₁₄	O ₂	H ₂ O	CO ₂	N ₂	T (K)	P (bar)	τ (μ s)
n-decane (~99% argon)	1.5	8.66E-4	-	-	8.98E-3	-	-	-	1345	10.31	706.0
		8.76E-4			9.09E-3				1415	10.90	320.8
		8.70E-4			8.91E-3				1452	11.01	210.6
		8.74E-4			9.05E-3				1496	11.09	187.2
		8.64E-4			8.89E-3				1499	11.12	143.9
		8.64E-4			8.89E-3				1514	10.44	106.3
		8.70E-4			8.91E-3				1570	10.67	84.7
		8.66E-4			8.98E-3				1614	10.69	40.1
		8.64E-4			8.89E-3				1646	10.54	34.8
		8.70E-4			8.91E-3				1657	10.19	33.8
		8.76E-4			9.09E-3				1676	11.49	43.6
		8.66E-4			8.98E-3				1677	10.13	28.0
		8.74E-4			9.05E-3				1736	10.46	33.0
	1.0	6.07E-4	-	-	9.38E-3	-	-	-	1352	10.65	425.2
		6.07E-4			9.38E-3				1401	10.98	316.6
		6.00E-4			9.35E-3				1414	9.98	187.8
		6.00E-4			9.37E-3				1430	10.43	227.4
		6.08E-4			9.39E-3				1435	11.01	127.7
		6.04E-4			9.40E-3				1438	11.31	206.6
		6.00E-4			9.23E-3				1449	8.64	184.8
		6.10E-4			9.23E-3				1467	10.67	127.4
		6.00E-4			9.23E-3				1487	10.32	90.4
		6.10E-4			9.23E-3				1504	10.61	75.9
		6.10E-4			9.23E-3				1539	10.41	44.5
		6.04E-4			9.40E-3				1542	10.09	48.4
		6.04E-4			9.40E-3				1551	9.84	41.6
		6.00E-4			9.23E-3				1591	9.99	32.6
		6.00E-4			9.37E-3				1613	10.92	23.3
		6.04E-4			9.40E-3				1623	10.80	24.7
		6.08E-4			9.39E-3				1632	10.63	21.4
	0.5	3.08E-4	-	-	9.49E-3	-	-	-	1344	9.97	216.4
		3.06E-4			9.47E-3				1381	9.69	223.8
		3.00E-4			9.73E-3				1411	10.46	173.2
		3.10E-4			9.54E-3				1454	10.35	75.1
		3.06E-4			9.47E-3				1454	11.20	93.0
		3.10E-4			9.54E-3				1462	10.03	72.9
		3.08E-4			9.49E-3				1490	11.61	38.1
		3.10E-4			9.54E-3				1509	9.90	46.3
		3.00E-4			9.73E-3				1535	10.26	24.4
		3.06E-4			9.47E-3				1536	10.91	30.7
		3.06E-4			9.47E-3				1542	11.11	26.4
		3.10E-4			9.68E-3				1557	10.24	21.6
		3.10E-4			9.68E-3				1581	10.22	19.4
		3.10E-4			9.68E-3				1616	10.81	15.0