

APPENDIX A. — SUMMARY OF COMBUSTION PROPERTIES OF LIQUID AND GASEOUS COMPOUNDS¹ (GASEOUS COMBUSTION IN AIR AT ATMOSPHERIC PRESSURE) — Continued

Combustible	Formula	Mol wt	Sp gr (air = 1)	BP, °C	C _{st} (in air), vol pct	ΔH _i (25° C), kcal/mol	ΔH _c (net, 25° C), kcal/mol	Flash-point, °C	Minimum AIT, °C	Flammable limits	
										L ₂₅ , vol pct	U ₂₅ , vol pct
KETONES (ALKYLS) — continued											
Diethyl ketone (3-pentanone)	(C ₂ H ₅) ₂ CO	86.14	2.97	102	2.90	- 61.8	692	13 oc	450	1.6	NA
Methyl propyl ketone	CH ₃ COC ₃ H ₇	86.14	2.97	102	2.90	- 61.8	692	7	505	1.6	8.2
Methyl butyl ketone	CH ₃ COC ₄ H ₉	100.16	3.46	128	2.40	- 78.9	840	35 oc	533	⁴ 1.2	⁷ 8
Methyl isobutyl ketone	CH ₃ COC ₄ H ₉	100.16	3.5	117	2.40	- 92.9(l)	818	23	460	1.4	⁷ 5
Diisobutyl ketone	(C ₄ H ₉) ₂ CO	142.23	4.9	168	1.59	NA	NA	60	NA	⁷ 7.9	⁷ 6.2
KETONES (MISCELLANEOUS)											
Methyl isopropenyl ketone	CH ₂ COC ₃ H ₅	83.11	2.9	98	3.24	NA	NA	NA	NA	⁴ 1.8	⁴ 9
Cyclohexanone	C ₆ H ₁₀ CO	98.15	3.4	156	2.55	- 55.0	798	44	420	⁷ 1.1	NA
Acetyl acetone (pentanedione)	(CH ₃ CO) ₂ CH ₂	100.13	3.5	139	3.37	- 127.6(l)	574	41 oc	340	² 1.7	NA
Acetophenone (acetylbenzene)	C ₆ H ₅ COCH ₃	120.16	4.1	202	2.16	- 20.8	963	82 oc	570	² 1.1	NA
Isoforone	C ₈ H ₁₄ CO	138.20	NA	215	1.72	NA	NA	84 oc	460	⁶ 8.4	NA
ACIDS (ALKYLS AND AROMATICS)											
Formic acid (methanoic)	HCOOH	46.03	1.6	101	29.53	- 90.5	61	¹² 69	¹² 601	NA	NA
Acetic acid (ethanoic)	CH ₃ COOH	60.05	2.1	118	9.48	- 103.9	200	43	465	⁷ 5.4	⁷ 16
Butyric acid (butanoic)	C ₃ H ₇ COOH	88.12	3.0	164	4.02	- 127.6(l)	480	- 72	450	⁶ 2.0	⁶ 10
Valeric acid (pentanoic)	C ₄ H ₉ COOH	102.13	NA	186	3.12	- 117.2	412	96 oc	400	NA	NA
Benzoic acid	C ₆ H ₅ COOH	122.13	4.21	249	2.72	- 69.4	762	121	570	NA	NA
Adipic acid (hexandioic)	C ₄ H ₈ (COOH) ₂	146.14	5.04	338	3.12	- 236.5(s)	617	196	420	² 1.6	NA
Stearic acid	C ₁₇ H ₃₅ COOH	284.50	NA	360	.80	- 213.1(l)	2,520	196	395	NA	NA
ANHYDRIDES (MISCELLANEOUS)											
Maleic anhydride	(CHCO) ₂ O	98.06	NA	202	6.53	- 112.4(s)	322	102	477	⁶ 1.4	⁶ 7.1
Acetic anhydride	(CH ₃ CO) ₂ O	102.09	3.5	140	4.97	- 137.6	412	54	390	⁴ 2.7	² 10
Phthalic anhydride	C ₆ H ₄ (CO) ₂ O	148.12	NA	295	2.72	- 110.1(s)	758	152	570	¹⁰ 1.2	¹¹ 9.2
ESTERS (ALKYLS)											
Methyl formate (methyl methanoate)	HCOOCH ₃	60.05	2.07	32	9.48	- 83.6	219	- 19	465	5.0	23
Ethyl formate	HCOOC ₂ H ₅	74.08	2.56	55	5.65	- 88.7	367	- 20	455	2.8	16
n-Butyl formate	HCOOC ₄ H ₉	102.13	3.53	107	3.12	NA	650	18	322	1.7	8.2
Methyl acetate	CH ₃ COOCH ₃	74.08	2.56	57	5.65	- 97.9	358	- 10	502	3.2	16
Ethyl acetate	CH ₃ COOC ₂ H ₅	88.12	3.04	77	4.02	- 105.9(l)	504	- 4	427	2.2	11
n-Propyl acetate	CH ₃ COOC ₃ H ₇	102.13	3.53	102	3.12	NA	650	14	450	1.8	⁵ 8
Isopropyl acetate	CH ₃ COOC ₃ H ₇	102.13	3.5	88	3.12	- 124.0(l)	635	4	460	² 1.7	NA
n-Butyl acetate	CH ₃ COOC ₄ H ₉	116.16	4.01	127	2.55	- 126.1(l)	785	22	425	⁴ 1.4	⁷ 8
Isobutyl acetate	CH ₃ COOC ₄ H ₉	116.16	4.0	118	2.55	- 124.0(l)	787	18	421	2.4	10.5
n-Amyl acetate (pentyl acetate)	CH ₃ COOC ₅ H ₁₁	130.19	4.50	149	2.16	NA	970	25	360	⁷ 1.0	⁷ 7.1
Isoamyl acetate	CH ₃ COOC ₅ H ₁₁	130.19	4.5	142	2.16	NA	NA	25	360	⁷ 1.1	⁷ 7
Methyl propionate	C ₂ H ₅ COOCH ₃	88.12	3.04	80	4.02	- 113.0(l)	494	- 2	469	2.4	13
Ethyl propionate	C ₂ H ₅ COOC ₂ H ₅	102.13	3.53	99	3.12	- 114.2(l)	645	12	440	1.8	11
n-Amyl propionate	C ₂ H ₅ COOC ₅ H ₁₁	144.22	NA	169	1.87	NA	NA	41 oc	380	² 1.0	NA
Methyl butyrate	C ₃ H ₇ COOCH ₃	102.13	3.52	102	3.12	- 119.0(l)	640	14	NA	NA	NA
Ethyl butyrate	C ₃ H ₇ COOC ₂ H ₅	116.16	4.0	121	2.55	- 123.0(l)	788	26	463	NA	NA
n-Butyl stearate	C ₁₇ H ₃₅ COOC ₄ H ₉	340.60	NA	223	.65	NA	NA	160	355	² 3	NA
ESTERS (MISCELLANEOUS)											
β-Propiolactone	C ₂ H ₄ CO ₂	72.06	2.5	162	6.53	- 67.6	330	74	NA	³ 2.9	NA
γ-Butyrolactone	C ₃ H ₆ CO ₂	86.09	NA	206	4.45	- 99.2(l)	450	98 oc	NA	¹⁰ 2.0	NA
Vinyl acetate (ethenyl ethanoate)	CH ₃ COOC ₂ H ₃	86.09	3.0	72	4.44	- 83.6(l)	466	- 8	427	2.6	13.4
Methyl acrylate	C ₂ H ₃ COOCH ₃	86.09	3.0	80	4.44	NA	NA	- 3	468	2.8	⁶ 25
Methyl lactate	C ₂ H ₄ OHCOCCH ₃	104.12	3.6	145	4.45	- 152.3(l)	455	49	385	⁷ 2.2	NA
Ethyl lactate	C ₂ H ₄ OHCOCOC ₂ H ₅	118.13	4.1	155	3.37	- 158.6(l)	601	46	400	⁷ 1.5	NA
Methyl cellosolve acetate	CH ₃ COOC ₂ H ₄ OCCH ₃	118.13	4.1	145	3.37	NA	NA	- 44	NA	¹⁰ 1.7	⁶ 8.2
Cyclohexylacetate	CH ₃ COOC ₆ H ₁₁	142.20	4.9	174	1.96	NA	NA	58	335	² 1.0	NA
Benzyl benzoate	C ₆ H ₅ COOC ₇ H ₇	212.24	7.3	323	1.29	- 65.1(s)	1,598	148	480	² 7	NA

Kuchta, J. M. (1985). Investigation of fire and explosion accidents in the chemical, mining, and fuel-related industries—a manual. Bulletin 680, U.S. Bureau of Mines.