

## APPENDIX

# B

## DATA TABLES

These tables are adapted from Reference [9]. See footnotes for explanations of symbols.

*Flammability Data for Gases and Vapors in Dry Air at 1 atm, 25°C  
Except Where Indicated*

Gas/Vapor	LMIE = G (mJ)	Stoi (vol%)	Opt = C <sub>0</sub> (vol%)	LFL (vol%)	UFL (vol%)	Su (cm/s)	LOC in N <sub>2</sub> (vol%)
acetaldehyde	0.13(a)	7.73		4.0	57.0		
acetone	0.19(a)	4.97		2.6	12.8	54	11.5
acetone (in oxygen)	0.0024			2.5	60		n/a
acetylene	0.017	7.72	8.5	2.5	100	166	0
acetylene (in oxygen)	0.0002	28.6	40	2.5	100	1140	n/a
acetylene (decomp @ 1 atm)	10 <sup>3</sup> -10 <sup>5</sup>	100	100	n/a	100		0
acetylene (decomp @ 2 atm)	10 <sup>2</sup> -10 <sup>3</sup>	100	100	n/a	100		0
acrolein	0.13	5.64		2.8	31	66	
acrylonitrile	0.16	5.29	9.0	3.0	17.0	50	
allyl chloride	0.77(b)			2.9	11.1		
ammonia	680	21.8		15	28		
benzene	0.20	2.72	4.7	1.2	7.8	48	11.4
1,3 butadiene	0.13	3.67	5.2	2.0	12	68	10.5
n-butane	0.25	3.12	4.7	1.6	8.4	45	12
n-butane (in oxygen)	0.009	13.3		1.6	49		n/a

Gas/Vapor	LMIE = G (mJ)	Stoi (vol%)	Opt = C <sub>0</sub> (vol%)	LFL (vol%)	UFL (vol%)	Su (cm/s)	LOC in N <sub>2</sub> (vol%)
<i>n</i> -butyl chloride	1.24(b)	3.37		1.8	10.1		
carbon disulfide	0.009	6.53	7.8	1.0	50.0	58	5
cyclohexane	0.22	2.27	3.8	1.3	8.0	46	
cyclopentadiene	0.17(a)					46	
cyclopentane	0.24(a)	2.71		1.5		44	
cyclopropane	0.17	4.44	6.3	2.4	10.4	56	11.5
cyclopropane (in oxygen)	0.001		17	2.5	60		n/a
dichlorosilane	0.015	17.4		4.7	96		
diethyl ether	0.19	3.37	5.1	1.9	36	47	10.5
diethyl ether (in oxygen)	0.0012		14	2.0	82		n/a
dihydropyran	0.36						
diisobutylene	0.23(a)			1.1	6.0		
diisopropyl ether	0.23(a)			1.4	7.9		
dimethoxymethane (methylal)	0.12(a)			2.2	13.8		
2,2-dimethylbutane	0.25	2.16	3.4	1.2	7.0	42	
dimethyl ether	0.15(a)			3.4	27.0	54	
2,2-dimethyl propane	1.57			1.4	7.5	39	
dimethyl sulfide	0.48(b)			2.2	19.7		
di- <i>t</i> -butyl peroxide	0.41						
ethane	0.23	5.64	6.5	3.0	12.5	47	11
ethane (in oxygen)	0.0019	22.2	17	3.0	66		n/a
ethanol	0.23(a)	6.53		3.3	19		10.5
ethyl acetate	0.23(a)	4.02	5.2	2.0	11.5	38	
ethyl acrylate	0.18(a)			1.4	14		8
ethylamine	0.19(a)	5.28		3.5	14		
ethylene	0.084	6.53	7.5	2.7	36	80	10
ethylene (in oxygen)	0.00094	25.0	22.5	3.0	80		n/a
ethyleneimine	0.11(a)			3.6	46	46	
ethylene oxide	0.065	7.72	10.8	3.0	100	108	0
ethylene oxide (decomp)	~1500	100	n/a	n/a	100		0

Gas/Vapor	LMIE = G (mJ)	Stoi (vol%)	Opt = C <sub>0</sub> (vol%)	LFL (vol%)	UFL (vol%)	Su (cm/s)	LOC in N <sub>2</sub> (vol%)
furan	0.14(a)	4.44		2.3	14.3		
<i>n</i> -heptane	0.24	1.87	3.4	1.05	6.7	46	11.5
<i>n</i> -hexane	0.24	2.16	3.8	1.1	7.5	46	12
<i>n</i> -hexane (in oxygen)	0.006	9.52		1.2	52*		n/a
hydrogen	0.016	29.5	28	5±1	75	312	5
hydrogen (in oxygen)	0.0012	66.7		4.0	94	1400	n/a
hydrogen (in nitric oxide)	8.7	50.0					n/a
hydrogen sulfide	0.068			4.0	44		7.5
isooctane	0.25(a)	1.65		0.95	6.0	41	
isopropyl alcohol	0.21(a)	4.44		2.0	12.7	41	
isopropyl chloride	1.08(b)			2.8	10.7		
isopropylamine	0.23(a)					31	
methane	0.21	9.47	8.5	5.0	15.0	40	12
methane (in oxygen)	0.0027	33.3	23	5.1	61	450	n/a
methane (in nitric oxide)	8.7						n/a
methanol	0.14	12.24	14.7	6.0	36.0	56	10
methylacetylene	0.11	4.98	6.5	1.7			
methyl acrylate	0.18(a)			2.8	25		8.7
methylene chloride	>1000			14	22		19
methylene chloride (in oxygen)	0.137			11.7	68		n/a
methyl ethyl ketone	0.21(a)	3.66	5.3	2.0	12.0		11
methyl butane (isopentane)	0.21	2.55	3.8	1.4	7.6	43	12
methyl cyclohexane	0.27	1.96	3.5	1.2	6.7	44	
methyl formate	0.13(a)			4.5	23		
<i>n</i> -pentane	0.28	2.55	3.3	1.5	7.8	46	12
2-methyl pentene	0.18	2.72	4.4			47	
propadiene	0.087(a)						
propane	0.25	4.02	5.2	2.1	9.5	46	11.5
propane (in oxygen)	0.0021	16.7	15				n/a
propionaldehyde	0.18(a)			2.6	17	58	

Gas/Vapor	LMIE = G (mJ)	Stoi (vol%)	Opt = C <sub>0</sub> (vol%)	LFL (vol%)	UFL (vol%)	Su (cm/s)	LOC in N <sub>2</sub> (vol%)
<i>n</i> -propyl chloride	1.08(b)			2.6	11.1		
propylene	0.18(a)	4.45		2.0	11.0	52	11.5
propylene oxide	0.13	4.98	7.5	2.3	36.0	82	7.8
isopropyl mercaptan	0.53(b)						
styrene	0.18(a)	2.05		0.9	6.8		9.0
tetrahydrofuran	0.19(a)			2.0	11.8		
tetrahydropyran	0.22		4.7			48	
thiophene	0.39(b)						
toluene	0.24	2.27	4.1	1.1	7.1	41	9.5
trichloroethane				7.5	12.5		14
trichloroethane (in oxygen)	0.092			5.5*	57*		n/a
trichlorosilane	0.017			7.0	83		
triethylamine	0.22(a)	2.10		1.2	8.0		
vinyl acetate	0.16(a)	4.45		2.6	13.4		
vinyl acetylene	0.082			1.7	100		0
xylene(s)	0.2	1.96		1.0	7.0		

**LMIE** = lowest minimum ignition energy measured at optimum concentration  
[G in Eq. (6-1.3.1)]

**Stoi** = stoichiometric concentration

**Opt** = optimum concentration at which LMIE was measured [C<sub>0</sub> in Eq. (6-1.3.1)]

**LFL** = lower flammable limit

**UFL** = upper flammable limit

**Su** = fundamental burning velocity

**LOC** = limiting oxygen concentration of fuel–oxygen–nitrogen mixture

n/a = not applicable

(a) = LMIE calculated using heat of oxidation method [229]

(b) = LMIE is too high (measured at stoichiometric concentration)

but is not amenable to calculation using the heat of oxidation method [229]

**Note 1:** It is possible that the fuel concentration most easily ignited by capacitive spark discharge, as reported in this table (C<sub>0</sub>), might differ from that most easily ignited by other types of static discharge (eg brush discharge). See 2-6.2.1.

**Note 2:** LFL and UFL values in air taken primarily from NFPA 325.

**Note 3:** LMIE, LFL and UFL values in oxygen taken primarily from NFPA 53 (\* denotes elevated temperature).

**Note 4:** Su values taken from [223].

**Note 5:** LOC values taken primarily from NFPA 69. Some reported values might be too high (see reference [229]).