FUEL DATA FOR COMBUSTION WITH AIR

Fuel	Formula (state)	Density [kg/m³]	Theoretical air/fuel ratio	Higher Heating Value [MJ/kg]	Maximum adiabatic combustion *T* [K]	Flash point &Autoignition temperature[a] [K]	Ignition limits[b]	Laminar deflagration speed (max.) [m/s]
Acetylene	C_2H_2(g)	1.1	11.9 m^3/m^3	48	2500[*]	<180, 600	2.5..100	1.5
Benzene	C_6H_6(l)	880	13.3 kg/kg	42.3	2400	262, 840	1.5..7.5	1.1
Bio-diesel	$C_{17}H_{32}O_2$(l) esters	880	12.4 kg/kg	40	-	420, -		
Bio-petrol	$C_6H_{14}O$(l) Ethyl Tert. Butyl Ether	750	12.2 kg/kg	36	-	-		
n-Butane	C_4H_{10}(g)	2.4	31 m^3/m^3	49.5	2250	210, 670	1.5..9.3	0.45
iso-Butane	C_4H_{10}(g)	2.4	31 m^3/m^3	49.5	2250	190, 710	1.6..8.4	0.45
Carbon (graphite)	C(s)	2250	11.5 kg/kg	33		600, 670		
Carbon monoxide	CO(g)	1.2	2.4 m^3/m^3	10	2400	-, 900	12..75	0.20
Coal (dry, mean)	85%C5%H5%O5%M(s)[c]	1300..1400	10 kg/kg	31	2200	550, 600		
Diesel or Gas-oil	87%C13%H(l)[d]	820..860	14.5 kg/kg	47		330, 480	0.6..8	
DME	C_2H_6O(g) (dimethyl ether)	1.8	14.3 m^3/m^3	30		232, 600	3.4..20	0.40
ETBE	$C_6H_{14}O$(l) (ethyl tert-butyl ether)	770	12.2 kg/kg	43		248, 580	1.4..10	
Ethane	C_2H_6(g)	1.2	16.7 m^3/m^3	51.9	2100	140, 800	3.0..15	0.40
Ethanol	C_2H_6O(l)	790	9.0 kg/kg	29.7	2200	285, 630	3.3..21	0.80
Ether	$C_4H_{10}O$(l) (diethyl ether)	715	11.2 kg/kg	37.2		230, 440	1.8..37	
Fuel-oil	84%C10%H3%S1%N2%H2 O(l)[e]	850..990	15 kg/kg	44	2200	320, 480	0.7..5	
Gasoline	85%C15%H(l)[f]	730..760	14.7 kg/kg	48	2200	230, 650	1.3..8	0.35
n-Hexadecane	$C_{16}H_{34}$(l)	773	14.9 kg/kg	47.3	2200	400, 475	0.5..4.7	
n-Heptane	C_7H_{16}(l)	685	15.2 kg/kg	48.1	2200	269, 560	1.1..6.7	0.40

Hydrogen	$H_2(g)$	0.08	2.4 m^3/m^3	142	2400	-, 850	4.0..75	3.5
Kerosene Jet A-1	85%C15%H(l)[g]	780..840	15 kg/kg	47	2300	330, 500	0.7..6	0.20
Methane	$CH_4(g)$	0.67	9.5 m^3/m^3	55.5	2200	85, 850	4.5..16	0.45
Methanol	$CH_4O(l)$	790	6.5 kg/kg	22.7	2150	285, 680	6.0..37	0.50
Natural gas	$CH_4(g)$[h]	0.68..0.70	9.5 m^3/m^3	54	2250	-, 850	5.3..15	0.45
n-Octane	$C_8H_{18}(l)$	703	15 kg/kg	47.9	2300	286, 500	1..6	0.40
iso-Octane	$C_8H_{18}(l)$[i]	690	15 kg/kg	47.9	2300	261, 690	1..6	0.40
Propane	$C_3H_8(g)$	1.8	23.8 m^3/m^3	50.0	2250	170, 750	2.0..9.5	0.45
Propylene	$C_3H_6(g)$	1.8	21.4 m^3/m^3	48.9	-		2.4..11	-
Wood (dry, mean)	50%C5%H45%O(s)[j]	500..1000	5.6 kg/kg	20	2100	550, 700		-

All data for combustion with air, at 298 K and 100 kPa. Additional data in Wiki.
*Maximum adiabatic combustion temperature for the oxyacetylene torch 3400 K.
[a]Flash point: minimum temperature for spark ignition near the condensed phase. Autoignition: minimum temperature for self ignition (without spark).
[b]% by volume of gaseous fuel in the mixture with air.
[c]% by weight, dry bituminous coal; C refers to total carbon content (fixed plus volatile matter), M refers to inert matter.
[d]% by weight; diesel or gas-oil is a distilled mixture with M=0.17..0.20 kg/mol, T_b=470..530 K (10% and 90% boiled), p_v(38 ºC)=0.7 kPa, $\nu<4\times10^{-6}$ m^2/s at 55 ºC (the flash point of diesel), 50..55 cetane number, and sulfur content <500 ppm, that may be approximated by $C_{12}H_{26}$ (n-Dodecane). Cetane is n-hexadecane, $C_{16}H_{34}$. As for most hydrocarbons, the solubility in water is negligible, and it may be carcinogen.
[e]% by weight; fuel-oils are mixtures of residues and heavy fraction distillates (and maybe used and waste oils), with sulfur content <0.5%, and may be approximated by $C_{14}H_{26}$. Pour points are usually below 0 ºC for distillates and below 20 ºC for residuals, but they are heated for handling.
[f]% by weight; gasoline is a distilled mixture with M=0.10..0.12 kg/mol, T_b=300..440 K (10% and 90% boiled), p_v(38 ºC)=60 kPa for the summer blend and p_v(40 ºC)=90 kPa for the winter blend, 90..100 motor octane number, and sulfur content <300 ppm, that may be approximated by C_7H_{17} or C_8H_{18} (iso-octane), except for the vapour pressure. Composition differences yield a wide scatter in property values; e.g. the flash point may range from -230 K to 240 K, autoignition temperature from 550 K to 750 K.
[g]% by weight; kerosene (or kerosene) is a distilled mixture with T_b=450..600 K (10% and 90% boiled), T_f=–40 ºC, $\nu=8\times10^{-6}$ m^2/s at –20 ºC, that may be approximated by n-dodecane ($C_{12}H_{26}$) or 1-dodecene ($C_{12}H_{24}$). Commercial (Jet A-1, Jet A, and Jet B) and military (JP-4, JP-5, JP-8...) jet propulsion fuels, are basically mixtures of kerosene and gasoline (half-&-half for JP-4, 99.5% kerosene for JP-5 and JP-8, 100% kerosene for Jet A-1), plus special additives (1..2%): corrosion inhibitor, anti-icing, and anti-static compounds. Jet A-1 is the international jet fuel with T_f=–50 ºC (-47 ºC as a limit); Jet A (with T_f=–40 ºC) is a low-grade Jet A-1 only and mostly used in USA; and Jet B (T_f<–50 ºC), the commercial name of JP-4, is only used in very cold climates. They all have a lower heating value of 42.8..43.6 MJ/kg. Minimum flash point is 60 ºC for JP-5, 38 ºC for Jet A-1 and JP-8 (Jet A-1 typical value is 50 ºC, with a vapour pressure at this point of 1.5 kPa; 1 kPa at 38 ºC), and -20 ºC for JP-4. Typical density at 15 ºC is 810 kg/m^3 for Jet A-1, and 760 kg/m^3 for Jet B.
[h]Natural gas is a mixture with some 90% methane, M=0.017..0.019 kg/mol, T_b=110..120 K (10% and 90% boiled) and 120 motor octane number.
[i]Isooctane or trimethylpentane, T_f=166 K, T_b=372 K, c=2200 J/(kg×K), Motor Octane Number MON=100.
[j]% by weight; wood is basically cellulose, a long polysaccharide $(C_6H_{10}O_5)_n$ with n=5000..10000 and M=500..10000 kg/mol.