Alternative Fuels and Their Characteristics

Fuels	Chemical Classification	Origin	Derivation	Uses	Notes
Biodiesel	Ester	Vegetable oils	Transesterification	Burned in internal-combustion engines	Biodiesel may be used either as a replacement for or as a component of diesel fuel.
Biogas	Mixture of **paraffins** and simple organic compounds	Biomass	Anaerobic fermentation	Theoretically usable like natural gas for internal-combustion engines	Usually about 50-70% methane, the rest CO_2
Compressed natural gas (CNG)	Paraffin	Raw natural gas	Separation from natural gas liquids, compression to about 3,000 psi	Burned in internal-combustion engines	See also liquefied natural gas
Diesel	Mixture of **olefins**, paraffins, esters, **aromatics**, other compounds	Petroleum	Distillation	Burned in internal-combustion engines	Low-sulfur diesel is sometimes considered an alternative fuel.
Ethanol	Alcohol	Crops such as grains and sugar cane	Aerobic fermentation	Burned in internal-combustion engines	Mixed with 15% gasoline as an alternative fuel
Hydrogen	Element	Methanol, water	Heat transformation or electrolysis	Burned in internal-combustion engines; oxidized to generate electricity in fuel cells	Extracting hydrogen gas from water requires electricity, which can be generated by a variety of methods.

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Liquefied natural gas (LNG)	Paraffin	Raw natural gas	Separation from natural gas liquids, compression, refrigeration to -259°F	Burned in internal-combustion engines	See also compressed natural gas
Methanol	Alcohol	Biomass, natural gas, biogas	Reformation of natural gas, syngas or biogas; wood distillation	Burned in internal-combustion engine; possible on-board source of hydrogen atoms for fuel cells	As an alternative fuel for light-duty vehicles, mixed with 15% gasoline. For heavy-duty vehicles such as large buses, straight methanol is often used.
Propane	Paraffin	Raw natural gas, or petroleum	Separation from other natural gas liquids and methane; distillation at oil refinery. After extraction, compressed to liquid form	Burned in internal-combustion engine	Currently, about 2/3 of U.S. propane comes from natural gas, the rest from petroleum.
Reform-ulated gasoline (RFG)	Mixture of olefins, paraffins, ethers, aromatics, other compounds	Petroleum	Distillation or **catalytic cracking**	Burned in internal-combustion engines	In RFG, evaporation is reduced by removing more volatile compounds.
Syngas	Mixture of elemental and simple organic compounds	Biomass, coal	Thermochemical transformation	Theoretically usable like natural gas for internal-combustion engines; possible source of hydrogen for fuel cells	Mixture of hydrogen and CO_2