Ministry of Higher Education and Scientific Research Al-Mustaqbal University College

Department of Chemical Engineering and petroleum Industrials

Properties of crude oil

2nd Stage

Lecturer: Dr. Duaa Alwarid

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Material Safety Data Sheet

A Material Safety Data Sheet (MSDS) is a document that contains information on the potential hazards (health, fire, reactivity and environmental) and how to work safely with the chemical product.

It also contains information on the use, storage, handling and emergency procedures all related to the hazards of the material.

The MSDS can also contain many physical and chemical properties of a product. Here is light naphtha as an example:

PHYSICAL AND CHEMICAL PROPERTIES

Form	: Liquid	**Appearance**	: Colorless to light yellow
Flash point - typical	: -21.7 °C (-7.1 °F)	**Odor**	: Characteristic hydrocarbon-like
Auto Ignition temperature	: 225 °C (437 °F)	**pH**	: Not applicable
Thermal decomposition	: Heating can release hazardous gases, No decomposition if stored and applied as directed.		
Lower explosive limit	: 1.2 % (V)	**Specific gravity**	: 0.77 (H20=1)
Upper explosive limit	: 6.9 % (V)	**Boiling point**	: 26.7 - 148.9 °C(80.1 - 300.0 °F)
Vapor Pressure	: 758 - 896 hPa at 20 °C (68 °F)	**Viscosity**	: Not determined
		Percent Volatiles	: 100 %
Vapor Density (Air = 1)	: 3.5	**Water solubility**	: Negligible

Type of naphtha	End- uses
Light naphtha	a- Gas making gasoline
	b-Special gasoline
Intermediate naphtha	a-Aviation gasoline
	b-Motor gasoline
	c- Marine gasoline
	d- Commercial solvent- Rubber, lacquer and pesticide diluens
	e-Benzene-High octane gasoline component, solvent petrochemical manufacture
	f-Xaylene- High octane gasoline component, lacquer and enamels, chemical intermediate
	g-Toluene- Solvent, high octane gasoline component, chemical intermediate, explosive
	h- Olefins and diolefins
	i- Ammonia production
Heavy naptha	a- VM&P(Varnish manufacture and paints) naphtha
	b- Thinner for paints, varnishes, lacquers
	c-Standard solvent – Special solvent for dry cleaning trade
	d- Mineral spirits- Thinner for paints and varnishes, turpentine substitute.

Gasoline

Motor gasoline called Petrol in Europa and Benzene in Iraq

It is a mixture of volatile flammable liquid hydrocarbons derived from petroleum that is used as fuel for internal combustion engines.

Gasoline is a liquid, that can be colourless, pale brown or pale pink.

The boiling range of motor gasoline falls between -1 C^0 and 216 C^0 and has the potential to contain several hundred isomers of various hydrocarbons.

The hydrocarbons constituents in this boiling range are those that have 4-12 carbon atoms in their molecular structure and fall into three general types:

- Paraffins (including the cycloparaffins and branched materials)
- Olefins (alkene).
- Aromatics.

Knocking of Gasoline Engine

Gasoline was at first produced by distillation, simply separating the volatile and more valuable fractions of crude petroleum.

Later processes, designed to raise the yield of gasoline from crude oil, split higher molecular weight into lower –molecular weight products by processes known as Cracking

Typical octane booster gasoline additives include Methyl *tetra*-butyl ether (MTBE), Ethyl *tert*-butyl ether (ETBE), isooctane and toluene. Lead in the form of tert-ethyl-lead was common additive, but its use for fuels for road vehicles has been progressively phased-out worldwide, beginning in the 1970s.

Production methods of Gasoline

a) Thermal cracking

Thermal cracking, in petroleum refining is the process by which heavy hydrocarbon molecules are broken up into lighter molecules by means of heat and usually pressure.

b) Catalytic Cracking

Catalytic cracking replaced thermal cracking in gasoline production

Catalytic cracking is the application of catalysts that create chemical reactions, producing more gasoline. The catalytic cracking process was invented by Eugene Houdry in 1937.

This process uses a catalyst, high temperature, and increased pressure to affect chemical changes in petroleum.

c) Polymerization

Another refining process is polymerization. This is the opposite of cracking in that it combines the smaller molecules of lighter gases into larger ones that can be used as liquid fuels.

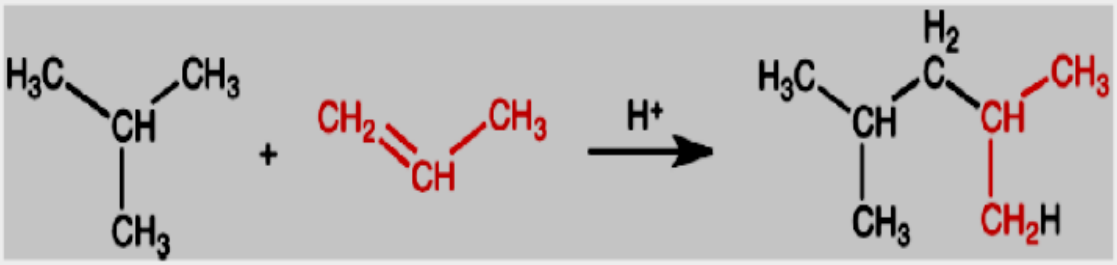
Thus, the polymerization is the thermally conversion of gaseous olefins such as propylene and butylene into larger molecules in the gasoline range.

d) Reforming

Reforming is the use of either heat or a catalyst to rearrange the molecular structure. Selection of the components and their proportions in a blend is the most complex problem in a refinery.

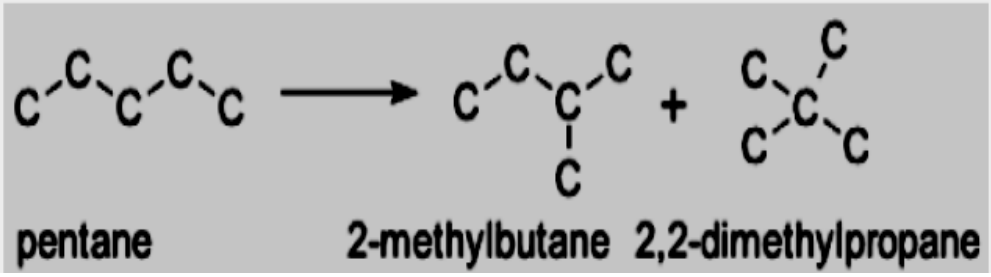
e) Alkylation:

Alkylation: a process combining an olefin and a paraffin such as isobutane to produce isoheptane or isooctane.



f) Isomerization :

Isomerization: the conversion of straight-chain hydrocarbons to branched-chain hydrocarbons by heating or using catalysts.



Test Methods

1. Volatility

Gasoline is more volatile than diesel oil and kerosene, not only because of the base constituents, but also because of additives.

It is determined by the Reid vapour pressure (RVP) test, which is a way to measure how quickly fuels evaporate.

Conversely, the gasoline must be sufficiently volatile to give easy starting, rapid warm up, and adequate vaporization for proper distribution between the cylinders.

To make it more volatile, gasoline is blended with butane (boiling point is −0.5 °C).

While Kerosene fuel is widely used for powering jet-engine aircraft, it is also has many domestic uses. It can be used as an efficient and economical alternative for heating or lighting a home or business.

It can be used to operate portable stoves for camping trips. It can also be used as a heat source during power outages.

Additionally, it can be used as a cleaning solvent, a lubricant, and a pesticide. Indeed, Kerosene is a versatile liquid that can be used for multiple functions.