



— University of Mosul —
College of Petroleum & Mining Engineering



Properties of Petroleum Products

Lecture 5

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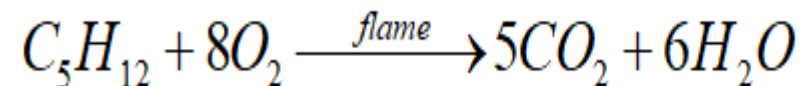
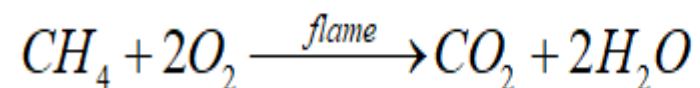
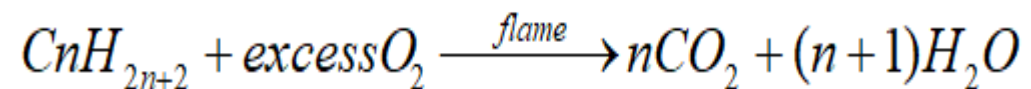
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10- Calorific Value (Heat of combustion)

The calorific value is the total energy released as heat when a substance undergoes complete combustion with oxygen under standard conditions. The chemical reaction is typically a hydrocarbon or other organic molecule reacting with oxygen to form carbon dioxide and water and release heat.



Which is the total heat generated by the burning of a unit of weight of the petroleum fraction completely burn, measured in BTU per pound at 60 °F. This represents the amount of heat needed to raise the temperature of one pound of water one degree Fahrenheit. This is important for heating oilsmol , kcal/kg, Btu/lb.

Heating value unit conversions:

$$\text{MJ/Kg} = \text{Kcal/Kg} \times 238.846$$

$$\text{Btu/lb} = \text{KJ/Kg} \times 2.326$$

$$\text{Btu/lb} = \text{Kcal/ Kg} \times 0.5556$$

The calorific value is conventionally measured with a bomb calorimeter. It may also be calculated as the difference between the heat of formation ΔH°_f of the products and reactants.

For a fuel of composition $C_cH_hO_oN_n$, the amount of the heat of combustion is 418 kJ/mol. The calorific value of all organic compounds has the sign corresponding to an exothermic reaction (negative in the standard chemical convention) because the double bond in oxygen molecular is much weaker than other double bonds or pairs of single bonds, particularly those in the combustion products carbon dioxide and water; conversion of the weak bonds in oxygen to the stronger bonds in carbon dioxide and water releases energy as heat.

11- volatility

The volatility of a liquid is its tendency to change from the liquid to the vapor or gaseous state at any given temperature.

Fuel volatility is the ability to evaporate and depends on the evaporation of any liquid on its vapor pressure, i.e., the pressure generated by volatile liquid vapor molecules on the liquid surface in equilibrium with atmospheric pressure. Steam pressure usually increases with temperature rise as the liquid begins to boil when its vapor pressure is equal to atmospheric pressure and expresses the vapor pressure of any liquid in terms of its boiling point and the fact that the petroleum fractions are composed of a mixture of hydrocarbons, each with a specific boiling point. For example, 80 °C.

12- Refractive index

Refractive index is an indicator used for light and medium petroleum fractions, usually it is higher for aromatics, lower for paraffins and medium. for naphthenes. It is increasing with increase the molecular weight.

Definition of refractive index

the ratio of the velocity of light (of specified wavelength) in the air, to its velocity in the substance under examination. The relative index of refraction is defined as the sine of the angle of incidence divided by the sine of the angle of refraction, as light passes from air into the substance. If absolute refractive index (that is, referred to vacuum) is desired, this value should be multiplied by the factor 1.00027, the absolute refractive index of air. The numerical value of refractive index of liquids varies inversely with both wavelength and temperature.

Refractive index is fundamental physical properties, which can be used in conjunction with other properties to characterize pure hydrocarbons and their mixtures.