



**— University of Mosul —**  
**College of Petroleum & Mining Engineering**



# **Petroleum Engineering**

## **Lecture 1**

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## College of Petroleum & Mining Engineering



- Introduction
- What is Petroleum Engineering?
- an engineering discipline concerned with the activities related to the production
- of hydrocarbons, which can be either crude oil or natural gas.
- A petroleum engineer is involved in nearly all stages of oil and gas field
- evaluation, development and production. The goal of a petroleum engineer is to
- maximize hydrocarbon recovery at a minimum cost while maintaining a strong
- emphasis on reducing all associated environmental problems.

Petroleum engineers are divided into several groups:

1-Petroleum geologists find hydrocarbons by analyzing subsurface structures with geological and geophysical methods.

2-Reservoir engineers work to optimize production of oil and gas via proper well placement, production levels, and enhanced oil recovery techniques.

3-Drilling engineers manage the technical aspects of drilling exploratory, production and injection wells. It also include mud engineer who manage the quality of drilling fluid.

4- Production engineers, including subsurface engineers, manage the interface between the reservoir and the well, including perforations, sand control, down hole flow control, and down hole monitoring equipment; evaluate artificial lift methods; and also select surface equipment that separates the produced fluids (oil, gas, and water).

## What Does Petroleum Mean?

Petroleum literally mean( rock oil). The word comes from the Latin word (petra) meaning rock and the word (oleum) meaning oil.

The oil we find underground is called crude oil.

Crude oil is made of mixture of different chemicals called hydrocarbons .

These were produced when tiny plants and animals decayed underground layers of sand and mud.

The crude oil is often mixed with gasses and water.

Oil and Gas are natural resources' of enormous economic importance.

Together they provide about 60% of all the energy used by society today.

## Origin of petroleum

Two main theories have been proposed to explain the origin of petroleum:

### a- Inorganic theory:

This theory assumes that oil and gas have originated in the earth's interior as a result of chemical reactions between hydrogen and carbon under conditions of high temperature and high pressure in the absence of organic matter.

### b- Organic theory:

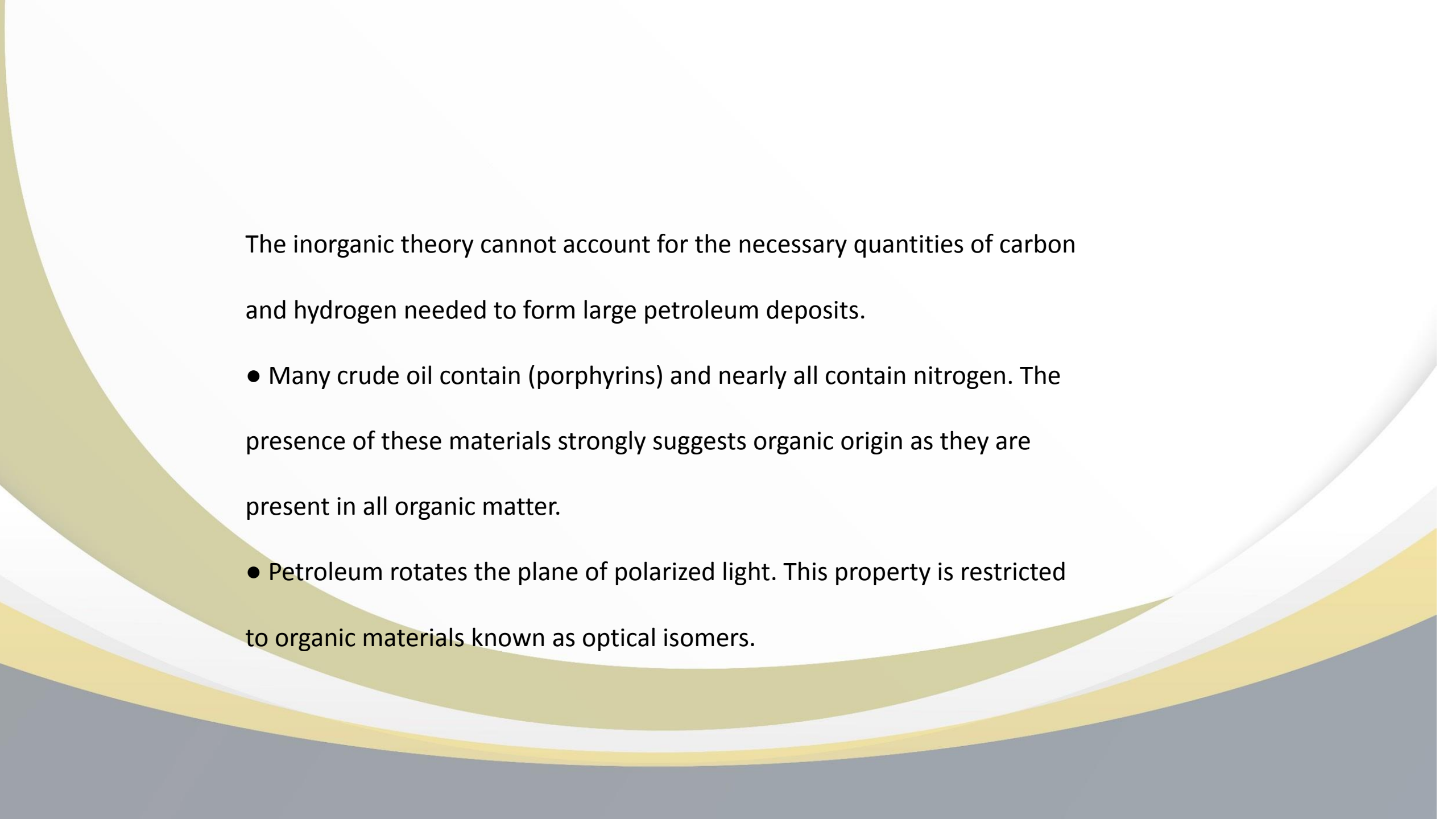
The organic theory of the origin of petroleum maintains that the hydrogen and carbon source for petroleum was organic material from decaying plants and animals forming and accumulating in oceanic sediments.

The remains of animals and plants have converted to liquids and gases hydrocarbon under the effect of high temperature and pressure. converted to liquids and gases hydrocarbon under the effect of high temperature and pressure.

This theory is more acceptable than the inorganic theory for the following reasons:

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The inorganic theory cannot account for the necessary quantities of carbon and hydrogen needed to form large petroleum deposits.

- Many crude oil contain (porphyrins) and nearly all contain nitrogen. The presence of these materials strongly suggests organic origin as they are present in all organic matter.
- Petroleum rotates the plane of polarized light. This property is restricted to organic materials known as optical isomers.



## The chemistry of petroleum

Petroleum is a mixture of hydrocarbons and other organic compounds that together dictate its chemical and physical properties. Hydrocarbons are molecules composed of hydrogen (H) and carbon (C) bonded together.

Petroleum also contains lesser quantities of organic molecules that contain nitrogen (N), oxygen (O), sulphur (S), and metals (Fe, Ni, Cu, ...), (Table 1).

The proportion of hydrocarbons in the mixture is highly variable and ranges from as much as 97% by weight in the lighter oils to as little as 50 % in the heavier oils and bitumen. The proportion of chemical elements varies over narrow limits as follow.

Table 1: Elemental composition of crude oils by weight %

Element	Weight %
Carbon	83 – 87
Hydrogen	10 – 14
Sulfur	0.05 – 6
Oxygen	0.05 – 2
Nitrogen	0.1 – 0.2
Metals (Fe, Ni, Cu, V, ...)	< 0.1