Generation, Migration and Accumulation

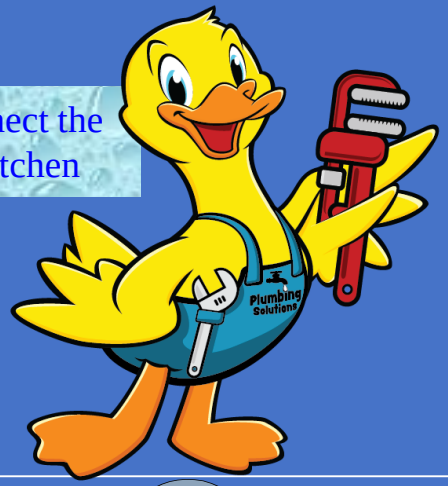
Generation

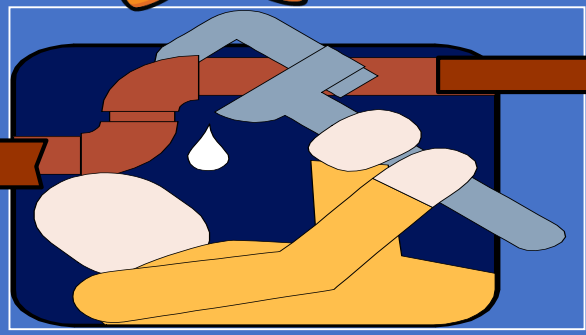
Migration

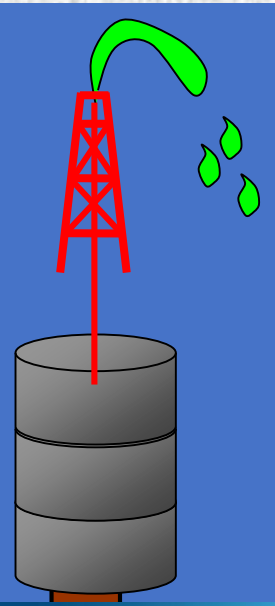
Accumulation

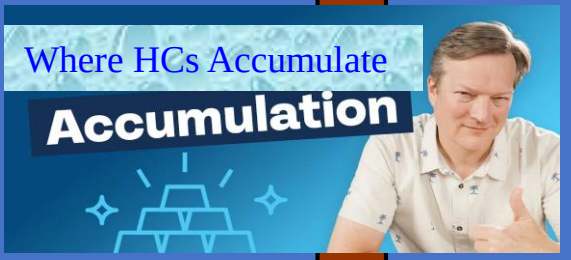
A "Kitchen" Where Organic Material Is Cooked

"Plumbing" To Connect the Container to the Kitchen









Million of Years

Generation, Migration and Accumulation

Generation of Oil & Gas

- Oil and gas molecules come from organic matter – plant or animal remains. The hydrocarbon (HC) generation process needs the right conditions for the chemical changes to occur. This primarily depends on temperature, which requires time for the organic matter to be buried and reactions to occur. We'll give some more details in the next few slides.

Organic Material

Plant or Animal Remains

Sugar $C_6H_{22}O_{11}$

+

Reaction Conditions

Time Burial Temperature

=

Oil - Gas Generation

Oil & Gas Molecules

Methane Gas CH_4

Generation, Migration and Accumulation

Generation of Oil & Gas

- The three main stages of generation of oil & gas

Diagenesis

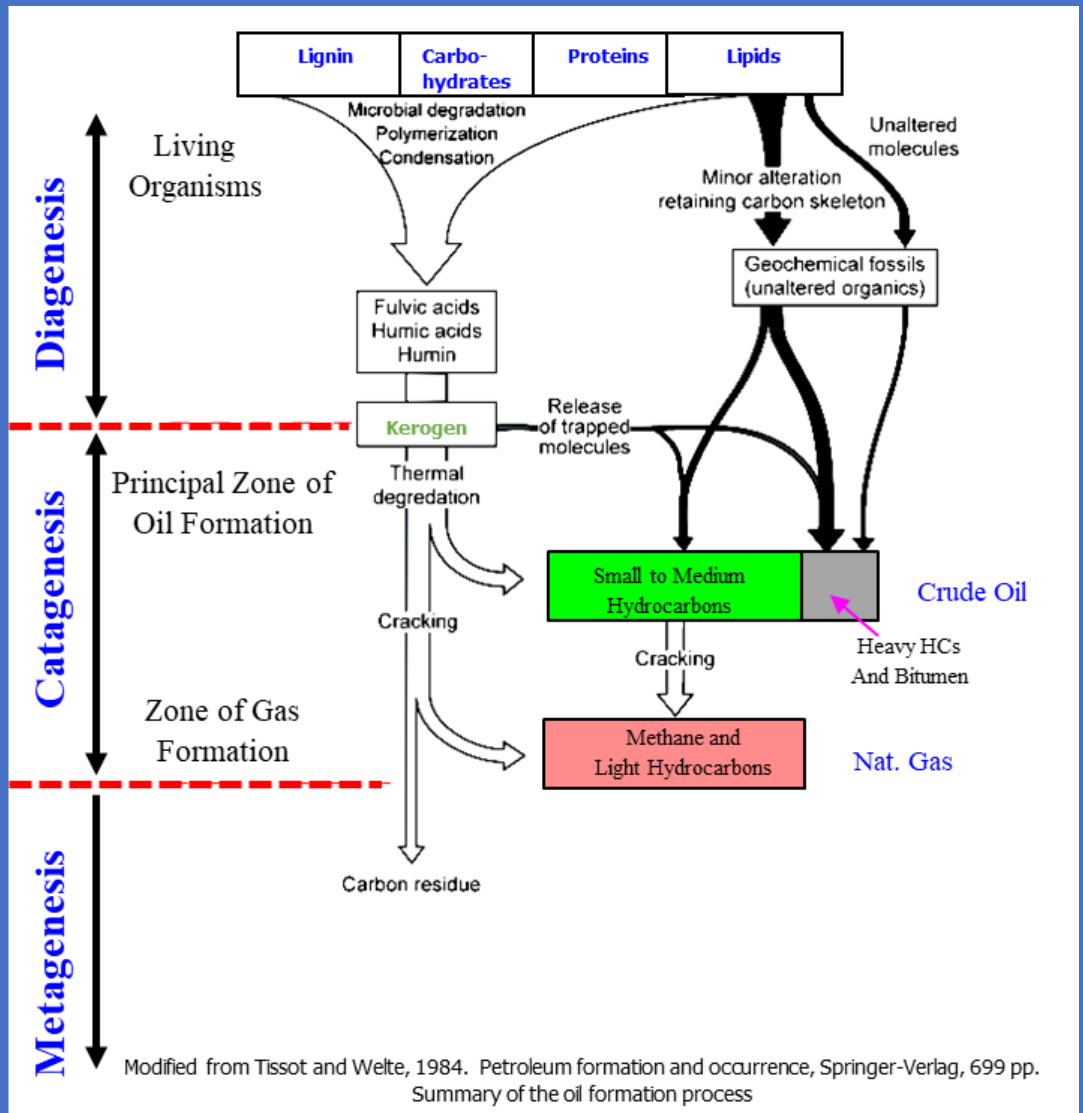
- Occurs at shallow depths, at temperature less than 50º C and normal pressure
- Methane, carbon dioxide, and water are released leaving behind the complex hydrocarbon called kerogen.

Catagenesis

- Occurs at more depths, *at temperature between 60 and 2000°C and higher* pressure.
- Petroleum is released from the kerogen – first oil is released and second gas is released

Metagenesis

- Occurs at deeper depths, *at temperature between over2000°C and higher* pressure.
- The only hydrocarbon that is released during this phase is methane



Modified from Tissot and Welte, 1984. Petroleum formation and occurrence, Springer-Verlag, 699 pp.
Summary of the oil formation process

Generation, Migration and Accumulation

Migration and Accumulation of Oil & Gas

Migration

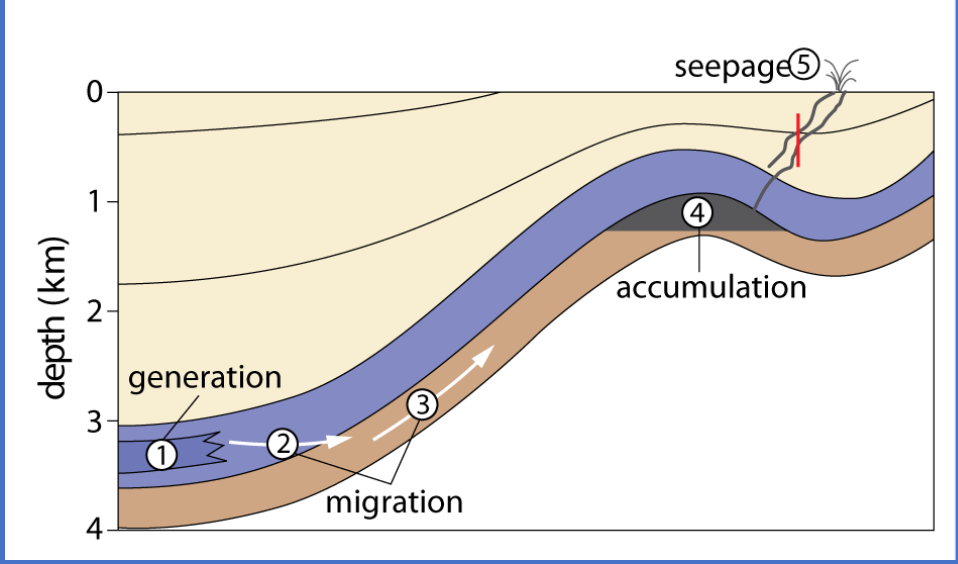
- It is the movement of hydrocarbons out of the source rock toward and into a trap. Migration occurs after/during generation of hydrocarbons.
- There are two major types of migration and that is primary migration and secondary migration.

I. Primary migration
- The transport of petroleum from the source rock to the reservoir rocks

II. Secondary migration
- The flow of petroleum within the carrier beds to, and in. the reservoir

Accumulation

- Hydrocarbons migrate up the flank of the basin and accumulate in a trap



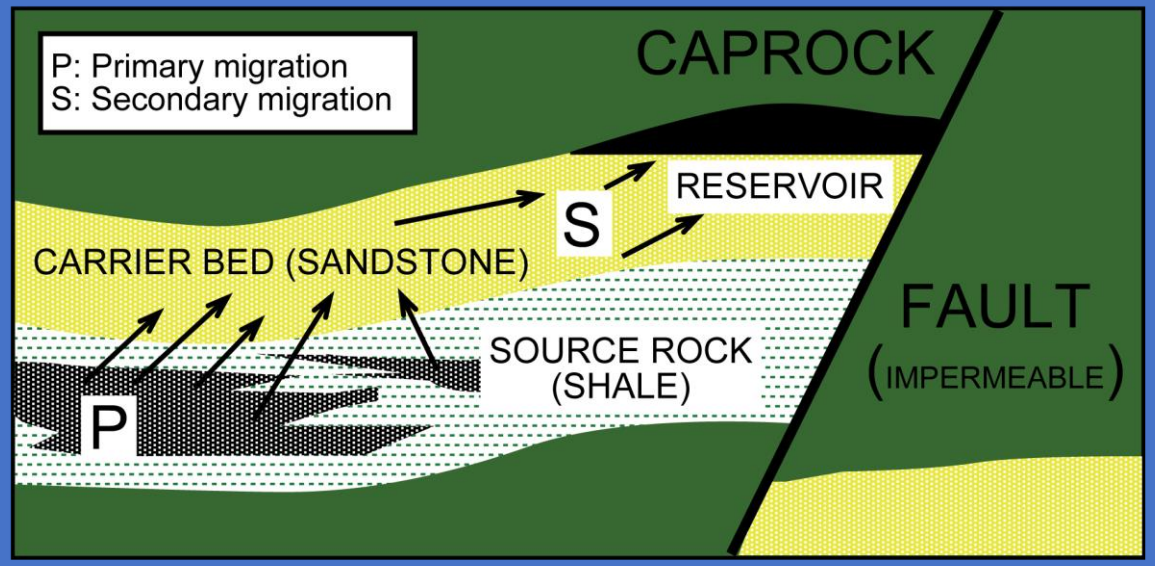


Diagram showing : 1) Petroleum generation in source rocks 2) Primary migration 3) Secondary migration 4) Accumulation of petroleum in a reservoir trap 5) Seepage of petroleum at the Earth's surface