Origin of Petroleum

Many theories have been proposed to this origin. Many hypotheses have been proposed to explain the origin but however these have some problem related to the origin.

i. Source material (Identification)
ii. Intermediate
iii. Biochemical Changes

There are basically 2 theories regarding the origin of petroleum.

1. Inorganic Origin
2. Organic origin

   Earlier ideas were in favour of inorganic origin of petroleum but modern theory point a definite finger towards the organic origin of petroleum.

   The general agreement now days is organic source material for the origin of petroleum.

   There are wide differences of opinion on the processes by which it form and on the nature of the organic matter from which it was derived.

   a. Whether the matter was animal or vegetal
   b. Whether it was deposited in a fresh water or saline water environment.
   c. Whether the organic source material was a decompositional residue of organic matter or a synthesis of existing hydro organic compound.

Further differences of thought arise when an attempt is made to explain the transformation of organic source material into petroleum.

a. Heat and pressure
b. Bacterial action
c. Radioactive bombardment
d. Catalytic reaction

These are possibly source of energy required for the transformation from organic source material to petroleum.

Inorganic Origin of Petroleum (Theories)

These theories have long being abundant or discarded and in the present context are of historic importance only.

The main reason or chief support for theories of inorganic origin lies in the fact that in laboratory the hydrocarbons methane, ethane, acetylene, benzene etc are repeatedly being made from, inorganic source.

One aspect of the theory of the inorganic origin of petroleum cannot be over looked and that is the possibility of its accounting for some of hydrocarbon content of petroleum. Ordinary marine organic matter contains approximately 7 – 10% hydrogen whereas petroleum contains 11 – 15%

hydrogen. Free hydrogen is not ordinarily found in sediment rock because hydrogen is the lightest of all gases and thereby it easily escape into the atmosphere.

There are two serious objections to the theories of organic origin.

1. Optical Activity : also known as optic rotary power, the power to rotate the plane of polarization of polarized light is a property of most petroleum and this phenomenon is entirely confined to organic matter and is observed only where biological agencies have prevailed.
2. The serious objection to any inorganic origin is that several homogeneous series of hydrocarbon compounds containing great numbers of individual members are found in all petroleum. All known compounds of this kind are of organic origin and could hardly reformed by inorganic agencies.

Theories in support of Organic Origin of Petroleum

Petroleum was originated from organic source called proto- petroleum- primary source material and is of organic origin.

There still exist different opinion that proto- petroleum is plant or animal.

There are 3 main evidence in support of organic origin of petroleum.

1. There is a vast amount of organic matter present in the sediments of the earth. Sufficient amount of hydrogen and carbon present in the remains of organic material.
2. The presence of porphyrin pigments and nitrogen in almost all kind of petroleum is a definite indication of its organic origin i.e more or less direct indication of the animal or vegetable origin or both of petroleum.

Porphyrin is a bi- product formed from the red colouring matter of blood or from green colouring matter of plants (Cholorophyll).

Nitrogen is an essential component of amino acid which infact is hydrolysed protein of all living matter.

3. Optical Rotatory Power with exception of quartz and cinnabar (HgS). It is believed that the optical activity in most oil is due to the presence of Cholestrol (C_{26} H_{45} OH) which is found in both vegetable and animal matter.

Stages in the Formation of Petroleum

At present most of the petroleum geologist believed in a 3 stage sequence of origin of petroleum.

1. A disseminated accumulation of organic matter in the shales, clays and other fined grained sediments occur as they are being deposited . if the hydrogen and carbon are

in the form of solid organic matter of considerable chemical complexity when deposited in the shale, then we have to think of mechanism for transforming this material into petroleum either in the shale or subsequently in the porous and permeable reservoir (source rock).

2. Either the organic matter or the petroleum moves out of the shale during their compaction by overloading and into the surrounding porous and permeable, sandstone or carbonate rock. This movement from the source rock to reservoir rock is called Primary Migration . (Reservoir Rock).
3. If the source material reaches the reservoir rocks its transformation into petroleum takes place through processes not known clearly. However a subsequent secondary migration through the permeable rocks carries it to places where further movement is obstructed and pools are formed. (Reservoir Trap).

Organic Source material

Organic source material required for the formation of petroleum may consist either of

- Animal remains
- Vegetable remains
- The waste material formed by organism during their life cycles.
  Since most petroleum deposits are closely associated with sediments deposited under marine condition . Most theories of organic origin hold the view that petroleum originated in sediments of marine environment. Consequently the organic matter of ocean is of prime importance. The marine organism that may provide organic source for petroleum may be :
  1. Plant Life : Marine fungi, bacteria , algae, dinoflagellates.
  2. Animal Life : may invlude many diverse group, such as foraminifera, radiolarian and other protozoans, the sponges, corals, warms, bryozoans etc.