

Coal and Petroleum

Coal & Destructive Distillation of Coal

COAL

- ❖ **INTRODUCTION:** Coal is a mineral of dark brown or black colour formed from the remains of plants buried in the earth's crust millions of years ago.
- ❖ **COMPOSITION:** Coal is a very impure form of carbon. It mainly consists of atoms of carbon, hydrogen and oxygen. A small amount of sulphur is also present in it.
- ❖ **MINING:** Coal is mined using two methods—opencast mining and underground mining. Opencast mining is used when the deposits of coal are near the surface of the earth. Underground mining is used when coal deposits lie deep inside the earth's crust.
- ❖ **FORMATION:** Coal is formed from vegetation matter buried under the earth. About 300 million years ago, the earth was covered with dense forests, marshlands and rivers. The forests grew and died and fell into the waters of the surrounding swamps. These plants were covered with tons of earth over a period of millions of years. Due to the huge pressure and temperature inside the earth, this vegetation matter got converted into coal. For this reason, coal is known as fossil fuel. It is also a non-renewable source of energy.
- ❖ **TYPES OF COAL:**

Coal comes in four main varieties. The percentage of carbon in air-dried samples are as follows.

- (i) **Peat:** This is a material in the first stage of coal formation. It contains only 27% carbon and is considered to be the lowest grade of coal.
- (ii) **Lignite:** This variety of coal contains 28-30% carbon. It has poor heating power. It is brown in colour but lustrous when dry.
- (iii) **Bituminous:** It is a soft coal containing 78-86% carbon. It gives a large proportion of gas when heated and burns with a yellow, luminous flame.
- (iv) **Anthracite:** It is a hard coal and contains 94-98% carbon. It is lustrous. It burns without smoke and gives much heat and little ash. Bituminous coal is by far the most useful as a fuel, but anthracite is considered to be the most superior in quality.

❖ USES:

- (i) Coal is used as a fuel to convert water into steam to run thermal power plants for the generation of electricity. It is also used as a fuel in homes and factories, and to run steam engines.
- (ii) Coal is used in the preparation of fuel gases, such as coal gas.
- (iii) Coal is used in the preparation of synthetic oil and synthetic natural gas.
- (iv) Coal is also used to obtain natural gas. For this, finely grinded coal is heated with hydrogen under pressure in the presence of a suitable catalyst. The complex molecules present in coal combine with
- (v) The destructive distillation of coal gives coke, coal tar, coal gas, etc.
- (vi) Coal is the source from which a number of organic compounds such as benzene, toluene, phenol, naphthalene and anthracene are obtained.

❖ Destructive Distillation of Coal

The process of destructive distillation is carried out by heating coal at a high temperature (1270 K) in the absence of air. This process is also called as pyrolysis and yields lot of valuable products.

(i) Products of destructive distillation of coal

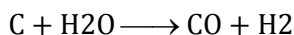
- (A) Coke
- (B) Coal Tar
- (C) Ammoniacal liquor
- (D) Coal gas

(ii) Coke: Solid residue left after destructive distillation (high percentage carbon-nearly 98%)

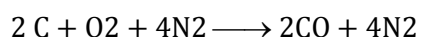
(iii) Uses:

- (i) As domestic fuel.
- (ii) Acts as a good reducing agent in the manufacture of steel
- (iii) Useful fuel gases like water gas and producer gases can be made using coke.

: Water gas is a mixture of carbon monoxide and hydrogen. It is obtained by passing steam over red-hot coke.



: Producer gas is a mixture of carbon monoxide and nitrogen. It is obtained when air is passed over red-hot coke.



- (iv) Used in metallurgical operations as a reducer for oxide ores.
- (v) **Coal Tar** : Coal tar is a mixture of different carbon compounds. It is a thick, black liquid. The fractional distillation of coal tar gives many chemical substances which are used in the preparation of dyes, explosives, paints, synthetic fibres, drugs and pesticides. Some of these chemical substances are benzene, toluene, phenol and aniline.
- (vi) **Ammoniacal Liquor** : The ammonia produced as a result of destructive distillation of coal is absorbed in water. The aqueous solution of ammonia, i.e., ammonium hydroxide solution, is called ammoniacal liquor. It is used in the preparation of fertilizers such as ammonium sulphate and ammonium superphosphate.

