



# SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

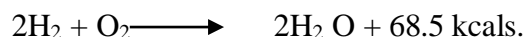


## FUELS & COMBUSTION

### INTRODUCTION

A fuel is a combustible substance containing carbon as the main constituent which on proper burning gives large amount of heat that can be used economically for domestic and industrial purposes. During the process of combustion of a fuel, the atoms of carbon, hydrogen, etc combine with oxygen with simultaneous liberation of heat.

The calorific value of a fuel depends mainly on the two elements.



So, carbon compounds have been used for many centuries as the source of heat and energy. The main source of fuel is coal and petroleum. These are stored fuels available in earth's crust and are generally called fossil fuels because they were formed from the fossilized remains of plants and animals.

Fossil fuels have been used for centuries to generate power, but there are many disadvantages associated with their use:

- Fossil fuels pollute the environment
- Fossil fuels are non-renewable and unsustainable
- Drilling for fossil fuels is a dangerous process
- **Classification of Fuels**
- Fuels are classified as:
  1. Primary fuels which occur in nature as such, e.g. coal, petroleum and natural gas.
  2. Secondary fuels which are derived from the primary fuels, e.g. coke, gasoline, coal gas, etc.
- Both primary and secondary fuels may be further classified based upon their physical state as
  - (i) Solid fuels (ii) liquid fuels and (iii) gaseous fuels.



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## Classification of Coal

Coal is classified on the basis of its rank. Rank is defined as the degree or level of maturity and is therefore a qualitative measure of carbon contents. These classifications are based on the amount of carbon, oxygen, and hydrogen present in the coal.

In the process of transformation (coalification), peat is altered to lignite, lignite is altered to sub-bituminous, sub-bituminous coal is altered to bituminous coal, and bituminous coal is altered to anthracite. Peat, lignite and sub-bituminous coals are referred as low rank coals while bituminous coals and anthracites are classed as high rank. The coal series is written as

Wood → peat → lignite → bituminous → anthracite.

## Peat

- First stage of transformation.
- Contains less than 40 to 55 per cent carbon (more impurities).
- Contains more volatile matter and lot of moisture [more smoke and more pollution].
- it burns like wood, gives less heat, emits more smoke and leaves a lot of ash.



## Lignite

- Brown coal. Lower grade coal. 40 to 55 per cent carbon.
- Intermediate stage. Dark to black brown.
- Moisture content is high (over 35 per cent).
- It undergoes spontaneous combustion [Bad. Creates fire accidents in mines]



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## Bituminous coal

- Soft, black colour, most widely available and used coal.
- 40 to 80 per cent carbon.
- Less moisture and volatile content (15 to 40 per cent)
- Calorific value is very high due to high proportion of carbon and low moisture.
- Used in production of coke and gas.



## Anthracite coal

- Best quality hard coal.
- 80 to 95 per cent carbon.
- Less volatile and moisture matter.
- Semi-metallic lustre.
- Ignites slowly and highly efficient.
- In India, it is found only in Jammu and Kashmir and that too in small quantity.



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