Proximate analysis of Coal

Introduction

Proximate Analysis includes analysis of basic things present in coal sample. It includes -

a. Determination of % Moisture
b. Determination of % Ash
c. Determination of % Volatile matter
d. Determination of % Fixed carbon

a. Determination of % Moisture

Procedure:

1. Weigh a clean dry and empty crucible (W_1 gm)

2. Take about 1gm of coal sample in the same crucible and weigh it again (W_2 gm).
3. Then place the silica crucible in muffle furnace or air oven, maintained at temperature range of 105-110 ^{O}C for 1 hour.
4. Cool it in a desiccator and weigh it again (W_3 gm). The loss in weight corresponds to moisture.

Observations:

Observations	Value
Weight of empty crucible (W_1)	= gm
Weight of crucible with coal sample (W_2)	= gm
Weight of crucible with coal sample after heating (W_3)	= gm
Weight of coal sample	($W_2 - W_1$)= gm

Formula and Calculation

Percentage of moisture   = Wt. of moisture / Wt. of coal x 100

$$= (W_2 - W_3)/(W_2 - W_1) \text{ x } 100$$

b. Determination of % Ash

Procedure:

1. First weigh the empty crucible (W_1 gm). Then take about 1gm of coal sample in the same crucible and weigh it again (W_2 gm).

2. Place the silica crucible in a muffle furnace at 750 ^{O}C for 1 hour to complete the combustion.
3. Then the crucible is removed and allowed to cool in desiccators to room temperature

and weigh it again (W₃ gm).

4. The amount of residue remaining in the crucible corresponds to the ash content of the coal.

Observations

Observations	Value
Weight of empty crucible (W_1)	= gm
Weight of crucible with coal sample (W_2)	= gm
Weight of crucible with coal sample after heating (W_3)	= gm
Weight of moisture/ ash	($W_3 - W_1$)= gm

Formula and Calculation

Percentage of ash = Wt. of ash / wt. of coal sample x 100

$$=(W_3 - W_1)/(W_2 - W_1) \text{ x } 100$$

c. Determination of % Ash

1. Moisture free coal is heated upto 925^0C temperature for 3-4 hrs.
2. It is (crucible along with coal)then kept into desiccator for cooling.
3. Again the weight of crucible is taken and % volatile matter is calculated as

Percentage of volatile matter = Wt. of volatile matter/ wt. of dry coal sample x 100

d. Determination of % Fixed carbon

This is actual carbon present in coal for combustion. It is calculated as

% of Fixed carbon = 100- (% Moisture + % Ash + % Volatile matter)

Significance of proximate analysis

a. Moisture lowers the calorific value and takes more the time to burn fuel. Therefore, less the % moisture, better is the quality of coal.

b. Ash is non-reducible byproduct formed after burning of coal. It has no calorific value. Therefore, less the % ash, better is the quality of coal.

c. Volatile matter elongates the flame size. Therefore, calorific value decreases. Therefore, less the % Volatile Matter, better is the quality of coal.

d. Fixed carbon is giving calorific value. Therefore, more the % fixed carbon, better is the quality of coal.