COAL PETROLOGY:

Coal type is related to the type of plant material in the peat and the extent of its biochemical and chemical alteration. Type can be assessed in terms of variety of petrographic analysis. Coal petrology is concerned with the origin, composition and properties of the distinct organic and inorganic components of different coals. To date, the principal practical application of coal petrology have been in the specification and selection of coals for carbonization.

MACROSCOPIC COMPONENTS OF COAL**(**visible to the necked eye): Megascopically distinguishable ingredients of humic coals are recognized, Vitrain, Clarain, Durain and Fusain. These varieties of coal have been invested with the status of separate "rock types", and are therefore termed as LITHOTYPES.

The four macroscopic components in coal are:

(a) VITRAIN: Essentially bright glossy, brilliant in luster and homogeneous component of coal, having a massive texture and showing characteristics vitreous conchoidal fracture.
(b) CLARAIN: Bright component of coal in overall appearance, but less brighter than vitrain. It is hetrogeneous material with a banded structure and has a definite and smooth surface when fractured at right angles to bedding plane.
(c) DURAIN: Essentially dull component of coal, often with a suggestion of a slightly greasy black in overall appearance, & usually harder than bright coal. it is hetrogeneous and has a firm granular texture.
(d) FUSAIN: It occurs in pockets or as patches rather than uniform brand, of soft, somewhat fibrous material resembling charcoal. It is highly friable and can be readily powdered by fingers.

The sapropelic coals are divided into two groups: the 'cannel coals' and the 'boghead coals'. The former are dullish black, with a slightly greasy appearance and conchoidal fracture; the latter are more brownish in colour.

MICROSCOPIC COMPONENTS OF COALS (invisible to the naked eye): Just as a rock is composed of several minerals so is the coal composed of several organic constituents termed as macerals, the organic equivalent of minerals (which are different types of inorganic particles found in coals and other rocks).

The micro-components (macerals) found in high and medium rank coals are:

1) VITRINITE (termed as HUMINITE for peat and Lignite or low rank coals, essentially woody materials): derived from plant cell substances varing in appearance from being completely structureless to exhibiting well discernible tissues. Major component of Vitrain and one of the two principal components of Clarain.
2) Exinite (LIPTINITE in low rank coals): derived from secretions and waxy coatings of plants, and lower in reflectance than vitrinite. The other principal component of clarain and durain.
3) INRETINITE (derived mainly from oxidised plant material): with or without recognizable plant structures, and higher in reflectance than vitrinite. Major component of Fusain. One of the two principal components of Durain. In maceral analysis, it is commonly subdivided into macerals **MACRINITE, MICRINITE, SEMIFUSINITE & FUSINITE.**

Principle technique of applied coal petrology:

a) Maceral analysis :- It is a technique widely used for providing valuable information on the behavior of coals during carbonization. The analysis summarized in terms of total REACTIVES (Vitrinite + exinite + 1/3 semi-fusinite) and total INERTS (2/3 semi fusinite + other inertinite macerals + mineral matter).

b) MICROLITHOTYPES Analysis: Macerals rarely occur at random within any lithyotype bands, under the microscope such a band can usually be seem to comprise thinner bands

distinguished from each other consisting of different maceral associations, and which are known as microlithotypes. This analysis is sometimes used as an additional aid in the study of coals for carbonization.

Determination of Reflectance:

As the reflectance of each maceral varies directly with coal rank. Reflectance measurement is a valuable technique for determining the latter with precision. However, the macerals of any particular coal differ from each other in reflectance, and determination of coal rank is therefore, normally based upon vitrinite reflectance. If coal carbonization technology, reflectance distribution is frequently used to calculated 'strength index' (SI) and 'composition balance index' (CBI) which are measure of the coking property of a coal or coal blend.

Principal Maceral group (s)	Principal Microlithotypes group(s)
Vitrinite	Vitrinite
Vitrinite,exinite	Clarite
Vitrinite, inertinite	Vitrinertite
Vitrinite, eximite, inertinite	trimacerite
Inertinite, exnite	durite
Inertinite	inertite

Lithotype	Prinicipal microlithotype
Vitrain	vitrite
Clarain	vitrite
	Clarite
	Vitrinertite
	Trimacerite
	Durite
Durain	Durite
Fusain	trimacerite
	Inertite

In a given coal, exinite has a higher volatile matter than vitrinite, whereas inertinite has a lower value.

The amount of mineral matter in most durains and fusains is considerably greater than in the corresponding vitrains, while it is intermediate in clarains. Qualitatively, the mineral matter content in vitrain generally tends to be lower in silica and alumina, and appreciably higher in alkalis, than in durain, while clarain is again intermediate. The mineral matter in fusain varies widely in composition.