

Elementary Knowledge about the application of Reflectance – Vitrinite

Vitrinite :

Denote a microscopically recognizable constituent of medium rank coal which is the chief constituent of bright coal. It is a group of macerals whose colour is grey and whose reflectance is generally between that of the associated darker liptinite and lighter inertinites over the rank range in which 3 respective maceral groups can be readily recognized.

Subdivision of the maceral group Vitrinite according to the new ICCP system 1994.

Subgroup	Maceral
Telovitrinite	Telinite
	Collotelinite
Detrovitrinite	Vitrodetrinite
	Collodetrinite
Gelovitrinite	Corpogelinite
	Gelinite

Physical Properties:

Colour and reflectance

- Both change progressively with rank.
- The colour is dark grey in low rank coal and thermally immature sediments but light grey to white in medium and high rank coal and sedimentary rocks of corresponding rank.
- Random reflectance measured in oil over this colour range is approximately 0.5 to > 7.0.
- Lower reflectance limit has been taken as the reflectance value separating medium rank coal (bituminous coal) and low rank coal (brown coal) .
- Bireflectance also increases with rank , except in some cases where coalification is caused by contact metamorphism.
- For this reason measurements of maximum reflectance are recommended above 1.3% Rr.
- Vitrinite reflectance values from a single seam or sediment can vary in response to differences in the origin of the Vitrinite macerals, changes in diagenesis or secondary thermal influence.

Fluorescence:

Fluorescence colour and intensity vary within the macerals of this group. They are also dependant on the rank and degree of bituminization. Vitrinite fluorescence begins at approximately 0.5% random Vitrinite reflectance and attains a maximum intensity between 1.0 and 1.2% Rr thereafter declining rapidly.

Telovitrinite :

Denote Vitrinite with cell structure. This structure may or may not be apparent in reflected white light. The macerals of this sub group are derived from the paranchymatous and woody tissue of roots, stems, barks and leaves composed of cellulose and lignin and originating from herbaceous and arborescent plant. Large amounts of televitrinite indicate a high degree of cell- tissue preservation under wet, possibly low ph condition within forest peatlands or forested wet raised bogs.

Telinite :

Telinite is a maceral of the Vitrinite group, subgroup telovitrinite, consisting of clearly recognizable cell walls of more or less intact plant tissue.

The size, shape and openness of cell lumens are variable depending on the original plant material. The shape of the cells may be subspherical or oval although often deformed. The cell walls are always gelified and because of this rarely show internal structure as can be seen in the precursor macerals. Fluorescence colour ranges from red- orange to red brown and are most marked in the attrital component of Vitrinite.

Chemical Properties :

Vitrinite is characterized by a relatively high oxygen content compared with the macerals of the other groups. Elemental composition is rank dependent and ranges as follows:

Carbon – 77-96% rarely 98%

Hydrogen – 6-1% , in per anthracite 0.2%

Oxygen- 16 – 1 %

Vitrinite is rich in aromatic structure. The aromaticity increases with rank from about 70%C in aromatic bonding in sub bituminous coal to over 90% in anthracite.

The lower the atomic H/C and O/C ratio the higher the aromaticity. The hetero atom (O, N, S) concentration decreases with increasing rank. Oxygen functional group are – Cooh, -OH, >C=O, -C-O-C, N occurs mainly as amine, and S as thiols and sulfides in heterocyclic ring.