



## **Palaeoenvironment characteristics from macrolithotype and XRD analysis of Permian coal seams, East Bokaro Coalfield, India**

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### **Abstract.**

The megascopic constituents of coal in the form of bright and dull bands are very much important to understand the palaeoenvironment characteristics of the coal seams. The Karo Group of Coal seams have been used to describe the Brighter Lithotypes (Vitrain and Clarain) and Dull Lithotypes (Durain and Fusain). It has been observed that the brighter bands, mostly clarain and then vitrain are present in dominant amount suggestive of Wet forest moor environment in majority of the coal seams. The XRD analysis shows presence of kaolinite, quartz and pyrite in the coal seams in larger quantity indicating the drift origin of the coal seams of the East Bokaro Coal Field. The coals of the area are weakly coking useful mainly for power generation and domestic purpose.

### **Introduction**

India has substantial coal reserves restricted to Gondwana and Tertiary sedimentary basins which form a predominant source of commercial energy. Coal is a phyto-organo-sedimento-metamorphosed rock derived mainly from plant remains that suffered lithification and coalification (Stach et al., 1982). Macropetrographic composition of the seams was determined by lithotype analysis. The term Lithotype was proposed by Seylor in 1954 (ICCP, 1963), these are macroscopically identifiable units or bands with a minimum of 3 to 10mm in thickness in bituminous humic coals. Lithotype description of the coal seams applied the system proposed by Diessel (1965), which defines black, glassy, vitreous material as vitrain, bright to semi-bright bands as clarain, grey to dull bands with a dull to slightly greasy lustre as durain and fibrous bands as fusain according to the macroscopic appearance of the coal samples. Variation in lithotype distribution has been used to interpret palaeo-depositional environment, with durain considered to represent the wettest condition and fusain the driest (Tasch, 1960). Powder samples were prepared for XRD Analysis to determine the mineralogical composition of the Coal seam of Dhori Area, East Bokaro Coalfield.

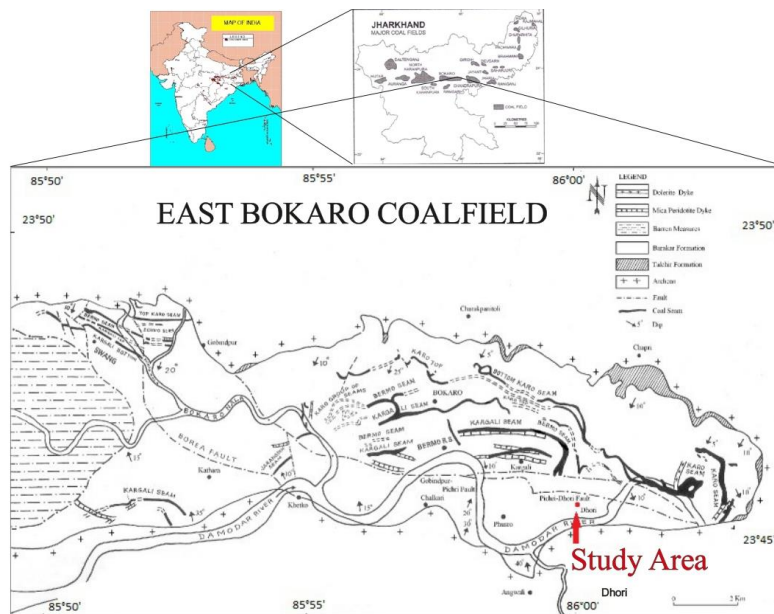


Figure: 1. Geological Map of East Bokaro Coalfield with location of study area Dhori (Modified after Tewari et al., 2015).

### Macropetrography and XRD Analysis

Macropetrographic characteristics describing the content of Lithotypes suggest variation in the content of Vitrain, Clarain, Durain and Fusain. The average lithotype content of Karo Special Seam III are Vitrain (45%, 40%, 13% and 2%). The Karo Group Seams (VI, VII and VIII) have Vitrain (38%, 36% and 29%), Clarain (47%, 49% and 53%), Durain (11%, 12% and 14%) and Fusain (4%, 3% and 4%). Bermo Seam contain Vitrain (18%), Clarain (62%), Durain (16%) and Fusain (4%). The brighter lithotypes are enriched in vitrinite, whereas the duller lithotypes show greater contents of inertinite or mineral matter or both (Kalkreuth et al., 2010). The observed high background intensity of the coal samples indicate the presence of highly disordered materials in coal in the form of amorphous carbon (Irdi et al., 1993). The XRD results indicate coals contain some crystalline carbon having the turbostratic structure (Neupane & Baral, 2018).

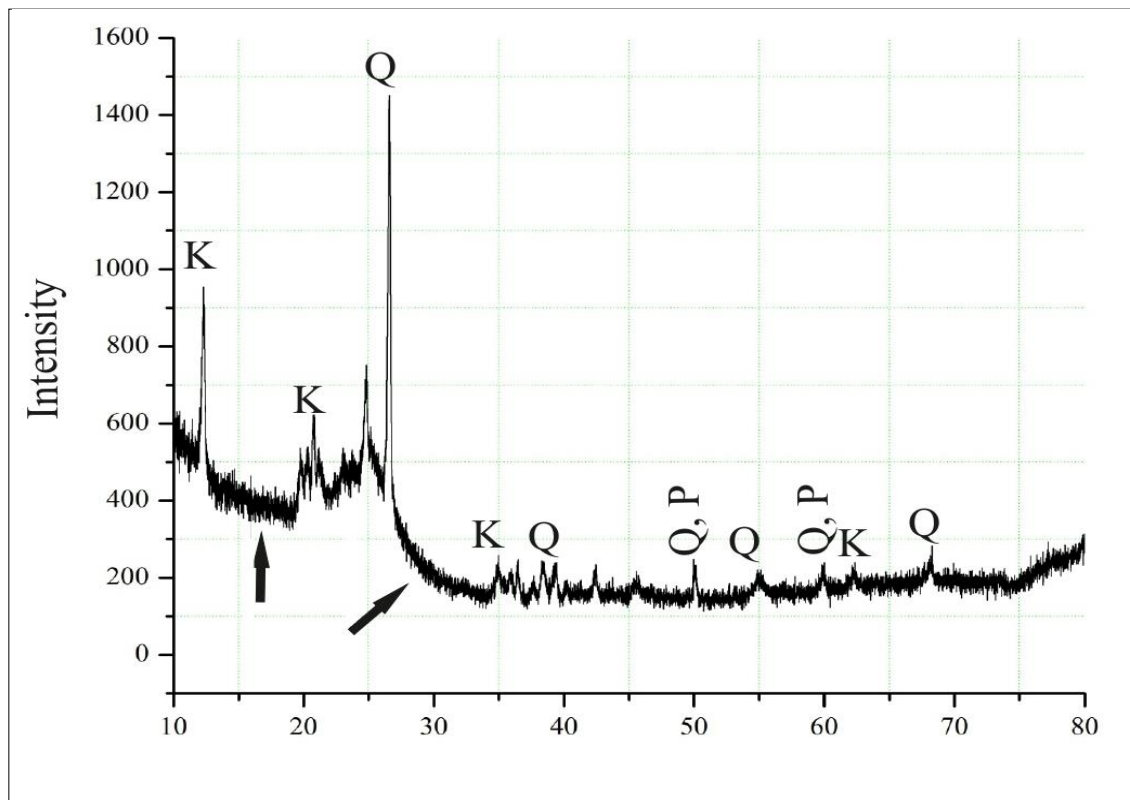


Figure 2: X-Ray Diffractogram of Coal Samples from Karo Special Seam III. Explanations: K: kaolinite; Q: quartz and P: Pyrite. The bold arrows indicate the development of amorphous nature within the sample.

### Conclusions:

The dominance of Clarain and sub-dominance of Vitrain lithotype suggest wet terrestrial forest moor palaeoenvironment setting for the formation of majority of the coal seams of the area. Marked Development of amorphous character was noted in the XRD plot study proves there are number of heat affected coals due to dolerite and igneous intrusive body. The results of X-ray Diffraction shows that Quartz and Kaolinite occur as dominant mineral phases. The coal samples of the seams exhibit minor peaks due to residue pyrite. The coals of the area are weakly coking used for coke, power generation, as well as domestic purpose.

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