SHORT COMMUNICATION

PETROGRAPHIC CHARACTERIZATION AND EVOLUTION OF THE COAL FROM PENCH-KANHAN VALLEY AND PATHAKHERA COALFIELDS, SATPURA BASIN

R. RAKESH SHUKLA
Banaras Hindu University, Varanasi - 221 005

Coal occurs in the Barakar Formation of Gondwana Supergroup. The formation thickens from 160 m in Pench valley, to 350 m in Kanhan valley, and 450 m in Pathakhera coalfields. The coal seams have been correlated geologically (Pareek, 1970) and by coal seam petrographic profiles (Pareek et al. 1964; Pareek, 1969) wherein vitrinite content is recorded to increase laterally, thereby enhancing the caking property of the coals. The present investigation is an outcome of petrographic studies on pillar coal samples collected from working faces in the three coalfields. Utilizing the scheme of Diessel (1985), megascopic seam profiles were prepared. Variation of each of the microscopic and chemical constituents were ascertained from bottom to top of each of the coal seams, being related to coal facies, rank and evolution, and their potential in utilization assessed.

These coals have vitrinite from 27.52 to 50.72%, while inertinite forms 25.27 to 51.14% and liptinite 9.80 to 20.27%. Blue irradiation study indicates the presence of secondary liptinite, i.e., exsundatinite (0.18 to 1.14%), fluorinite (0.23 to 2.09%) and bituminite (nil to 1.28%). Argillaceous mineral matter forms 4.13 to 12.80%, carbonates 0.60 to 1.21%, and sulphides 0.30 to 0.60%. In general, mineral concentration is higher in the coals of Pench valley. The microlithotype composition indicates that these coals have vitrinite 32.46% and inertinite 34.26%, with duroclarite, clarodurite and liptinite constituting less than 1%. The mean of random vitrinite reflectance (ROM) is 0.35 and 0.58% in Pench, 0.52 to 0.92% in Kanhan, and 0.53 to 0.88% in Pathakhera coals. As per ASTM classification, these coals are sub-bituminous C to high volatile bituminous A. On volatile matter (daf) basis they are sub-bituminous C to medium volatile bituminous. The H/C vs. O/C ratio suggests them to be of type III kerogen.

The plots of maceral and microlithotype composition cluster in the zone of foreland basin in the triangular diagram of Hunt and Smyth (1989). The microlithotype plots in the facies diagram of Hacquebard and Donaldson (1969) relate these coals to forest moor, under limno-telmatic conditions. The Gelification Index (Diessel, 1986) of these coals ranges between 0.40 to 2.20 and Tissue Preservation Index 1.57 to 35.94, suggestive of wet and partly dry condition of peat formation. The Ground Water Index (Calder et al. 1991) indicates development of these coals in fen and bagforest under mesotropic to ambrotrophic hydrological conditions. On the basis of the international coal classification system (Falcon, 1986), these coals are intermediate in type, meta sub-bituminous to hypo-bituminous in rank and ashy coal in grade. Based on petrographic and chemical composition, the Satpura coal is recommended for gasification and blending with coking coals.

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References

CALDER, J.H., GIBBING, M.R. and MUKHOPADHAY, P.K. (1991) Peat formation in a Westphalian B piedmont setting, Cumberland basin, Nova Scotia: Implication for the maceral-based interpretation of rheotropic and raised paleomires. Bull. Soc. Geol. Fr., v.162, pp.283-298.

DIESSEL, C.F.K. (1985) Correlation of macro- and micro-petrography of some New South Wales Coals. *In:* Proc. 8th Commonwealth Min. Metal. Congr., v.6, pp.669-677.

DIESSEL, C.F.K. (1986) On the correlation between coal facies and depositional environment. *In:* 20th Symposium on Advanced Studies of the Sydney Basin. Dept. Geol., Univ. New Castle, N.S.W., pp.19-22.

FALCON, R.M.S. (1986) Classification of coals in Southern Africa, 1899-1921. *In:* C.R. Anhaeusser and S. Maske (Eds.), Mineral Deposits of Southern Africa. Geol. Soc. South Africa, v.I and II, 2335p.

HACQUEBARD, P.A. and DONALDSON, J.R. (1969) Carboniferous coal deposition associated with flood plain and limnic environments in Nova Scotia. *In:* E.C. Dapples and M.E. Hopkins (Eds.), Environment of Coal Deposition. Geol. Soc. Amer. Spec. Paper, no.114, pp.143-191.

HUNT, J.W. and SMYTH, M. (1989) Origin of inertinite rich coals of Australian cratonic basins. Int. Jour. Coal Geol., v.11, pp.23-46.

PAREEK, H.S. (1969) The nature of coal from the Tandsi seam, Upper Tawa valley coalfield, M.P. Indian Minerals, v.20, pp.165-172.

PAREEK, H.S. (1970) On the geology and correlation of coal seams of Pench-Kanhan-Upper Tawa valley coalfield. Palaeobotanist, v.18, pp.95-102.

PAREEK, H.S., Sanyal, S.P. and Chakrabarati, N.C. (1964) Petrographic studies of the coal seams in the Pench-Kanhan coalfields, India. XXII Int. Geol. Cong. IX, Gondwana, pp.1-16.