

Kerogen properties and gas generation potential in Permian Shales from the Talabira mines, Ib River valley, Eastern India.

NIHAR RANJAN KAR¹, DEVLEENA MANI TIWARI²,
JOHN BURAGOHAIN³ AND E.V.S.S.K. BABU⁴

¹NATIONAL GEOPHYSICAL RESEARCH INSTITUTE

²University of Hyderabad

³CSIR-CIMFR, Dhanbad

⁴CSIR-National Geophysical Research Institute

Presenting Author: niharranjankar10@gmail.com

Ib River valley, one of the tributaries of Mahanadi basin, hosts the second largest coal mine of Odisha state in Eastern India. Permian–Triassic Gondwana sediments are deposited in an extensive basin, comprising of lower (Talchir, Karharbari and Barakar) and upper Permian (Barren Measure and Raniganj) sequences with coal measures in Karharbari and Barakar. Organically rich and thermally mature shales of the Gondwana period form the potential source cum reservoirs for the unconventional shale gas in the basin. Fifty-one samples comprising carbonaceous shales and coals from two short-boreholes (~ 134m & 191m) of Talabira mines, Ib river valley were studied for their organic richness, kerogen type and thermal maturity. Majority of samples are characterized by a high TOC content (>5 wt%). High proportions of hydrocarbons generated through thermal cracking of kerogen (S₂ ~60 mgHC/gTOC) for most of the samples suggest good residual hydrocarbon content of these rocks. Correlation of Rock-Eval pyrolysis parameters - Hydrogen indices and thermal maturity (HI vs T_{max}) suggest Type-III to Type-IV kerogen and a T_{max} close to the early oil window stage. Kinetic parameters for kerogen decomposition in the thermally immature samples indicate broader activation energies and moderate to high transformation ratios. Overall, excellent organic richness with high S₂ and TOC content of these rocks suggest the potential for gas generation. However, the T_{max} values suggest that the organic rich rocks in studied part of basin are not thermally mature to attain the gas generation stage.