

Integrated Surface Geochemical Exploration Case Histories from Selected Proterozoic and Mesozoic Basins of India: Implications for Hydrocarbon Generation Prospects

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Surface geochemical exploration is the technique for detection of any potential surface manifestations indicative of the subsurface occurrence of hydrocarbons. The soil/sediment gas geochemical methods for petroleum exploration have been widely used since past several decades. The rationale behind these methods is upward migration of light gases hydrocarbons from subsurface petroleum resource pools to surface along faults, fractures and permeable rock strata.

The geochemical methods to detect surface manifestations of hydrocarbons are classified into direct and indirect. The direct methods comprise of exploration techniques that are related to measurement of light gaseous hydrocarbons (C₁-C₅) in the near surface soil samples. The indirect methods detect any chemical, physical or microbiological changes in the soils associated with the oil and gas deposits which include soil salt, helium emanometry, microbial methods etc. (Jones & Drozd, 1983; Klusman, 1993).

Surface geochemical surveys have been carried out in selected Proterozoic (Vindhyan, Cuddapah, Bhima- Kaladgi & Chattishgarh) and Mesozoic (Kutch onland & Saurashtra) basins of India for determination of their hydrocarbon generation prospects. The surveys have shown high concentrations of C₁-C₄ and presence of C₂₊ components indicating that these gases may have been derived from thermogenic source (Kumar et.al, 2002; 2003; 2004; 2006). The surface geochemical data have been integrated using Arc GIS 8 software with the available geological and geophysical data to demarcate anomalous hydrocarbon zones. The results of the surveys will be presented and discussed to demonstrate the role of surface geochemical exploration in reducing risk in hydrocarbon exploration and exploitation.