

Adsorbed soil gas and microbial studies for Hydrocarbon prospecting: Jamnagar sub-basin, Gujarat, India

T. SATISH KUMAR¹, M.A. RASHEED¹, G. KALPANA¹,
D.J. PATIL AND A.M. DAYAL¹

¹Stable Isotope and Surface Geochemical Prospecting Lab,
National Geophysical Research Institute, Hyderabad 500
007, India (satishthadoju@gmail.com)

This study was designed to combine and compare Adsorbed gas (acid released gas) and Microbial methods with sub-surface geology. These techniques provides to understand the hydrocarbon generation, migration and accumulation processes within a basin prior to drilling. Sub - surface soil sample were collected on a detailed grid over the Jamnagar sub-basin, India. The area is largely covered and prominently exposed by the Deccan Trap (basaltic rocks), whose thickness varies from few hundreds to thousands of meters. Traps are underlain by thick Mesozoic sediments (100- 4000 m), which can form potential source rock for hydrocarbon. Deccan Trap volcanicity during Late Cretaceous may have generated the requisite thermal conditions and acted as a catalyst in Mesozoic hydrocarbon-generation process. Sedimentation in marine intertonguing environments is considered to have been favorable phenomena for hydrocarbon generation and entrapment (Kumar et al., 2004).

Adsorbed soil gas of light hydrocarbons (C₁ to C₅) shows variations in concentrations of Jamnagr sub-basin. The C₁, ΣC₂₊ and C₃ concentration range from 3-518 ppb, 0-977 ppb and 0 – 331 ppb, respectively. Corelation factor is more than 0.9 between C₁ - C₂, C₁ - C₃, C₂ - C₃ and C₁ - ΣC₂₊, which indicates that light hydrocarbon components are generated from a thermogenic source. The compositional ratio of C₃/C₁ × 10³ shows that majority of samples fall in oil zone (Jones&Drodz, 1983). The propane Oxidizing Bacteria counts varies from 60 – 68600 CFU/gm. Adsorbed soil gas and microbes intensities indicate that this is warm area for hydrocarbon. The adsorbed soil gas data and microbial population are concordant and coincide with major structural features in basin. This study clearly demonstrates that adsorbed soil gas and microbial methods with geology can be applied successfully to demarcate the hydrocarbon reservoir zone for future exploration.

Kumar¹ B, Patil¹ D.J, Kalpana¹ G. and Vishnu Vardhan¹ C
(2004) Search and Discovery Article #10138
Jones V.T. and Drozd R.J. (1983) *Geophysics*. **4**, 210-228.