

Geochemical Investigation of Shallow Sediment Samples near a Gas Show Site and its Exploration Significance in Mandi area of Himalayan Foot Hills Basin, India

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The increasing demand for petroleum products in India will enforce exploration activity to expand into frontier areas such as the Himalayan Foothills belt having an area of approximately 30000sq.km mostly consists of Mesoproterozoic-Cenozoic rocks. Twenty three wells have so far been drilled in this basin, but no major source rock sequences have been identified. Due the lack of commercial discovery/producing wells, the identified petroleum systems are only speculative. However, hydrocarbon shows in some of the drilled wells and gas seeps in different parts of the basin are indications that hydrocarbon generation and migration have taken place. In the drilled wells, Late Paleocene-Mid Eocene was not penetrated but in the exposed Late Paleocene-Mid Eocene sections, two oil shows in bituminous limestone are known near Mandi and Punch. The associated coal in the Late Paleocene-Mid Eocene outcrops of Jangal-Gali has attained metamorphism that is normally noticed in the peak-mature oil source beds. This may be due to local tectonic factors.

A maiden attempt have been made to apply integrated approach for characterizing both gaseous and liquid range hydrocarbons in the shallow sediments in order to derive more firm exploration lead regarding generation and migration of hydrocarbons. Geochemical investigations of surface and sub surface samples in the past have shown that the Siwalik and Dharmasala sediments have very poor potential of hydrocarbon generation. The well JMI-B is the deepest well drilled to the depth of 6720m and terminated within Late Eocene-Oligocene and Late Paleocene-Mid Eocene was not penetrated. However, two oil shows in bituminous limestone are known near Mandi and Punch in the exposed Late Paleocene-Mid Eocene sections. Stable carbon isotopic studies of surface gas shows recorded at many places in Himachal Pradesh also reveal thermogenic origin of the gas. These findings indicate that the mature source may lie in the deeper part of the basin and hydrocarbons migrated upwards.

Gas presence was reported during drilling of Borehole for installation of Hand Pump at Mera Masit, Mandi, Himachal Pradesh, in order to collect gas sample ONGC team visited the site and found no gas flow. The team collected six sediment samples from the site. Rock Eval pyrolysis studies of sediments indicate that out of six, three samples exhibit very good to excellent organic richness, remaining hydrocarbon generation potential(4.72-97.47mgHC/g rock) and they are in peak maturity stage (Tmax: 458-464°C).

Appreciable presence of free hydrocarbons (upto 4.04Kg/Ton of Rock) in the samples along with GC traces of the saturate hydrocarbon fractions of the bitumen extracts and presence of adsorbed gas of thermogenic origin enable to draw an inference that the studied sediments are at threshold of maturity. The equivalent sediments in the deeper part of the basin may act as good effective source rock capable of filling nearby structures and hence worthy as lead for future exploration.