

Origin of Biogenic Gases in East Coast Basins of India

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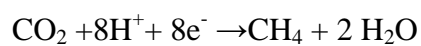
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Natural gas, which represents more than one fifth of total energy consumption in the world, is emerging as a potential clean fuel due to environmental concerns the world over. It has been the fastest growing fossil fuel since the seventies. Knowing whether a natural gas show is biogenic or thermogenic can have critical implications for the presence of hydrocarbons in a basin. Geochemical analyses can reveal the origin of a gas show or seep, and can divulge the presence of an effective petroleum system in a basin. The maturity of a natural gas is derived from its correlation from its source, relative percentage of gas components and their isotopic values ($\delta^{13}\text{C}$) and (δD). The evolution of methane gas by methanogens follows two metabolic pathways: CO_2 reduction and acetate fermentation. Acetate fermentation is regarded as major source of methane in fresh water environments:

$*\text{CH}_3\text{COOH} \rightarrow *\text{CH}_4 + \text{CO}_2$ (*) indicates the intact transfer of the methyl position to CH_4 .

Reduction of CO_2 by hydrogen in anoxic and sulphate deficient environment is the dominant pathway for microbial methane generation. All hydrogen incorporated into methane by this process comes from formation water. Almost all species of methanogens have the ability to form methane via reduction of CO_2 which can be represented in the following general equations:



Carbon isotopic studies in isolation has its limitation in explaining these metabolic pathways, hence hydrogen isotopic studies serve as a supplementary value addition tool for proper understanding the formation of natural gases. The accumulation of biogenic gas depends not only on the generation of significant quantities of gas but also on its entrapment. The other factors for commercial accumulations are the marine settings, early structural and stratigraphic traps, formation of adequate seals, rapid rates of sedimentation and deep water clastic habitat.

India's east coast is emerging as one of the hotspots in the world with huge reserves of natural gas. Two main basins in this area – Krishna Godavari and Mahanadi have shown the potential of vast gas reserves.