Mud Gas Isotopic Logging Using Mid Infrared Laser Spectromtory

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Concept of Mud Gas Isotope Logging (MGIL) has been proposed and accepted as a gas fingerprinting technique or advanced gas logging technique used in the isotopic analyses of circulating mud stream during well drilling. Around two decades have been proceeded in the progress of gas detection based on laser spectra, and these efforts have been evolved and thrived to be an emerging methodology in gas detection which could be seen in a wide usage and application in ecology, environics, botany, biology and even medical science. This paper aims to summarize the basic principles and methods on the laser spectra and the subsequent tech application, integrate the technical advantage based on the comparative datasets results of GC-IRMS, unite the industrial demands of petroleum R&D in recent years and envision the prospects of the combination in petroleum geology, especially in unconventional oil and gas exploration. These may include: (1) implementation of real-time oil & gas show and origin analysis in the whole well strata scale, expanding the single point or layer-based samples selection to a log-scale and whole well strata or inter wells and exhibiting oil & gas origin and distribution in vertical or even horizontal; (2) penetration of recognition in distribution of conventional and unconventional oil & gas reservoirs, data supplement for comprehensive understanding geological and geochemical processes of natural gas formation, distribution, migration and accumulation; (3) understanding of occurrence behavior in a um/nmn scale, directing the study in forming the geological and geochemical models for the generation-expulsion-accumulation in a self-sourced reservoir system; (4) solution in the identification of superior quality zones in the lateral shale gas well, performing parameters of evaluation in the shale gas productivity; (5) Method of prediction in the shale gas productivity circle time, enriching the index systems in the gas yield assessments and well life prediction in the productive wells; (6) Upgradation in the geological and geochemical understanding of gas hydrate accumulation system, making it an essential technical support in the origin, distribution and prediction of gas hydrates. A brand new opportunity has been brought out and into the detection of gas detection based on MIR for researchers in petroleum geology and geochemistry. Application in organic geochemistry and applied geochemistry makes this technology come to a discipline significance.