

Constraints on Source Rock Organic Matter Biodegradation in the Biogenic Gas Fields in the Sanhu Depression, Qaidam Basin, Northwestern China: A Study of Compound Concentration and Concentration Ratio Changes Using GC-MS Data

Authors : Mengsha Yin

Abstract : Extractable organic matter (EOM) from thirty-six biogenic gas source rocks from the Sanhu Depression in Qaidam Basin in northwestern China were obtained via Soxhlet extraction. Twenty-nine of them were conducted SARA (Saturates, Aromatics, Resins and Asphaltenes) separation for bulk composition analysis. Saturated and aromatic fractions of all the extractions were analyzed by Gas Chromatography-Mass Spectrometry (GC-MS) to investigate the compound compositions. More abundant n-alkanes, naphthalene, phenanthrene, dibenzothiophene and their alkylated products occur in samples in shallower depths. From 2000m downward, concentrations of these compounds increase sharply, and concentration ratios of more-over-less biodegradation susceptible compounds coincidentally decrease dramatically. $\Sigma_i C_{15-16, 18-20} / \Sigma_n C_{15-16, 18-20}$ and hopanoids/ Σ_n -alkanes concentration ratios and mono- and tri-aromatic sterane concentrations and concentration ratios frequently fluctuate with depth rather than trend with it, reflecting effects from organic input and paleoenvironments other than biodegradation. Saturated and aromatic compound distributions on the saturates and aromatics total ion chromatogram (TIC) traces of samples display different degrees of biodegradation. Dramatic and simultaneous variations in compound concentrations and their ratios at 2000m and their changes with depth underneath cooperatively justified the crucial control of burial depth on organic matter biodegradation scales in source rocks and prompted the proposition that 2000m is the bottom depth boundary for active microbial activities in this study. The study helps to better curb the conditions where effective source rocks occur in terms of depth in the Sanhu biogenic gas fields and calls for additional attention to source rock pore size estimation during biogenic gas source rock appraisals.

Keywords : pore space, Sanhu depression, saturated and aromatic hydrocarbon compound concentration, source rock organic matter biodegradation, total ion chromatogram

Conference Title : ICOGPG 2019 : International Conference on Organic Geochemistry and Petroleum Geology

Conference Location : Rome, Italy

Conference Dates : January 17-18, 2019