

Oil-source Rocks Correlation of Biodegradation Oil in Wen’an Slope, Baxian Depression, Bohai Bay Basin, China

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Bohai Bay Basin is one of the most petroliferous basin in China. Shallow reservoirs in this basin suffer from varying degrees of biodegradation, although they have prolific petroleum accumulations. As most petroleum accumulations in Wen’an slope, Baxian depression develop in ideal circumstance for biodegradation, where temperature is less than 80 corresponding depth <2000m, genetic relationships among the biodegradation oils and their source rocks have remained speculative. 25 crude oil samples in Wen’an slope were collected and analyzed quantitatively using gas chromatography (GC) and gas chromatography-mass spectrometry (GCMS). Geochemical data of source rocks and other necessary data for oil-source correlation were collected too. PM biodegradation scale (modified from Peters and Moldowan, 1993) used to research the extent of oil biodegradation. Eighteen of twenty-five oil samples in Wen’an slope show light-moderate biodegradation ranks (Figure 1, a). As PM scale is not sequential, a sequential biodegradation parameter, $nC_{17+18}/\alpha\beta-C_{30}hopane$, is proposed newly in this research to help to select anti-biodegradation biomarker parameters. This new parameter gets lower when biodegradation extent changes from light to severe (Figure 1, b) and shows good negative correlation $R^2=0.9281$ with PM scale (Figure 1, c). It is worth noting that, this new parameter may lose efficacy when C17 and C18 n-alkanes consume away in heavy- severe biodegradations. Biodegradation susceptible biomarker parameters such as Pr/Ph and Pr/nC17, show dramatically change along with the $nC_{17+18}/\alpha\beta-C_{30} Hopane$ (Figure 1, d), while anti-biodegradation biomarker parameters such as γ -cymene/(C31hopane/2) and $\beta\beta-C_{29}/\Sigma C_{29}sterane$, remain almost unchanged (Figure 1, e). Twenty anti-biodegradation biomarker parameters were selected for oil-source rocks correlation. The research shows that, twenty-three oil samples may come from Es1 source rock, one oil sample is a product of Es3U source rock and the rest one is a mixture of Es3ML and Es4 source rocks.

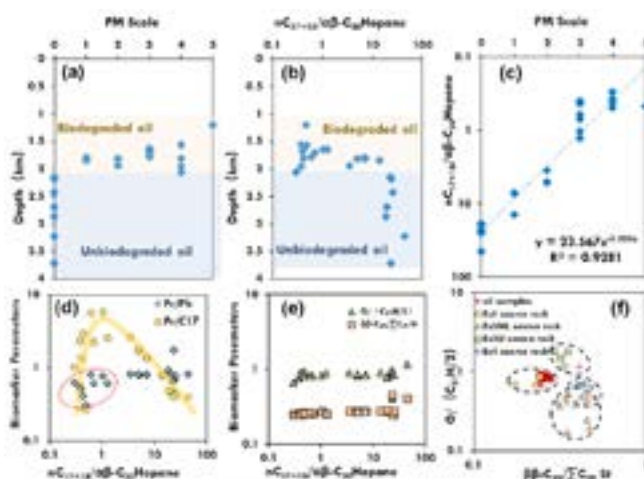


Fig: (a) Oil samples above 2000m show biodegradation ranks of 1 to 5 in PM scale. (b) Biodegradation consume more C17 and C18 n-alkanes than C30 Hopane, leads to reduce of the biodegradation parameter. (c) $nC_{17+18}/\alpha\beta-C_{30}Hopane$ shows good negative correlation with PM scale. (d) Pr/Ph and Pr/nC17 change along biodegradation extent. (e) γ -cymene/(C31hopane/2) and $\beta\beta-C_{29}/\Sigma C_{29}sterane$ do not change along biodegradation extent. (f) Anti-biodegradation biomarker parameters separate crude oil samples into three families on Scatter plot.

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3. Zhang L, Bai G, Zhao Y. Data-processing and recognition of seepage and microseepage anomalies of acid-extractable hydrocarbons in the south slope of the Dongying depression, eastern China[J]. *Marine & Petroleum Geology*, 2014, 57(57):385-402.
4. Li ZY, Zhang LP, Hao JL and Liang T, et al. Fused quartz powder: A potential reference material for NanoSIMS analysis of Al, Ca and Mg. *Acta Petrologica Sinica*, 33(10): 3278-3284
5. Zhang L, Zhao Y, Jin Z, et al. Geochemical characteristics of rare earth elements in petroleum and their responses to mantle-derived fluid: An example from the Dongying Depression, East China[J]. *Energy Exploration & Exploitation*, 2009, 27(1):47-68.

Biography

Shanshan Zhou is a research assistant at the Institute of Geology and Geophysics, Chinese Academy of Sciences, and she is mainly engaged in Petroleum Geology Research and Organic Geochemistry.

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