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Longmaxi formation shale gas sweet evaluation and optimization in the Upper Yangtze region

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The upper Yangtze region has experienced multi geological events and there is characteristic of high evolution and strong transformation of the marine shale. So that the shale gas accumulation is very complex. By the comparison of North American and the upper Yangtze shale, Longmaxi formation organic rich shale of the Upper Yangtze region is older, higher degree of evolution but the sedimentary environment and lithology basically is the same as North American Barnett shale. Due to Longmaxi shale experienced multi deformation and different burial environment, its hydrocarbon has entered the over-mature stage. North American tectonic is relatively stable and its shale is still in the middle-high mature stage. The upper Yangtze shale gas accumulation and preservation are controlled by the reservoir pore pressure and the sealing of the accumulation unit. Combined the Longmaxi shale reservoir and the stratigraphy deformation characteristics of the upper Yangtze region, the shale gas sweet is controlled by deep shelf anoxic face and structure transformation and adjustment zone. Recently, all of the found Longmaxi shale gas reservoirs locate in gentle wings and axis of residual syncline of the zone. And a series of identification technologies of the shale gas reservoir and prediction technologies of sweet distribution have been summed in the upper Yangtze region. Longmaxi shale gas layer takes it as a feature: High gamma, high acoustic time difference, low P-wave and S-wave velocity ratio and with high resistance, low density, low compensation neutron anomaly. The Longmaxi sweet layer appears low frequency wave impedance reflection and AVO anomalies. The structure transformation and adjustment zone shows the multi-source convergence and natural net-fracture reservoir conditions, therefore good accumulation units of syncline belts become shale gas high production in the upper Yangtze region marine. Therefore Longmaxi shale gas sweet is controlled by deep shelf anoxic face and tectonic transformation and adjustment zone in the upper Yangtze region.

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3D geochemical modeling with the use of vertical and horizontal relative concentrations of oil biomarkers for the heavy oil fields development monitoring

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Statement of the Problem: All heavy oil reservoirs under development in Tatarstan are presented by sands and heterogeneous, with respect to geology and, thus, the conformance of steam in the reservoir is not uniform. The purpose of this study is to detect lateral and vertical gradients of relative concentrations of biomarkers presented in oil, which allows assessing potential drainage zones in the reservoir during the reservoir production by steam injection. In this research, new method for monitoring of steam chamber development in 3D model was developed and tested.

Methodology & Theoretical Orientation: Total hydrocarbon fraction was isolated from core extracts and analyzed by GCMS method (TIC) for detection of various biomarkers and assessment of lateral and vertical gradients of their concentration in lateral.

Findings: It was found that the proportion of 4- and 1-methyldibenzothiophenes (MDBT) changes in lateral and in vertical directions. These changes are caused by biodegradation of organic matter. Laboratory research shows that 1-MDBT/4-MDBT ratio in native reservoir rocks is stable under high temperatures and pressure, so it can be measured in the samples of oil produced by SAGD method. This measurement will allow assessment of location and direction of steam chamber propagation.

Conclusion & Significance: In this work the authors have developed geochemical model which can be used for assessment of oil flow directions during the development of heavy oil fields by SAGD method.

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