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BIODEGRADATION OF OILS IN CRETACEOUS RESERVOIRS IN THE WEST SIBERIAN PETROLIFEROUS BASIN

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It is known [2, 5 et al] that biodegraded oils occur at shallow depths with low reservoir temperatures (not exceeding 70°C). In West Siberia such parameters typify, mainly, Cretaceous rocks (Aptian- Albian- Cenomanian and Berriasian- Hauterivian) [3].

With this work a collection of oils have been studied, confined to Cretaceous reservoirs in West Siberia. Sampling depths vary from 1270 to 3600 m, and reservoir temperatures vary from 40°C to 120°C. A comparative analysis is given on oils physical and chemical content composition, as well as on content composition of C_5-C_8 low-boiling HC, n-alkanes C_{10+}, a-cyclic isoprenoids, steranes and terpanes. To determine HC composition of oils, gas-liquid chromatography and chromato-mass-spectrometry methods were applied.

The comparative analysis of the obtained analytical data shows that biodegraded oils from West Siberia are characterized by higher density (900 kg/m^3 and more), compared to non-maturated oils, and their HC composition is quite specific.

By C_5 – C_8 HC group content composition biodegraded oils are distinguished by the lowest abundance of alkanes (not more than 55 per fraction), and C_5–C_8 n-alkanes versus C_5–C_8 i-alkanes ratio does not exceed 0.15. Cyclanes (cyclopentanes, cyclohexanes) account for maximum concentrations in oils from this group. The latter are also characterized by lowered n-heptane vs. methyl-cyclohexane (<0.10) and alkane vs. cyclanes (<0.50) ratios, comparing to native oils samples. Biodegraded oils are quite distinctly diagnosable in terms of hexanes and heptanes abundance nature. Among hexanes and heptanes in non-biodegraded oils there considerably predominate unsubstituted homologues. In biodegraded oils mono- and di substituted alkanes predominate among heptanes and hexanes, which accounts for considerable rise in concentrations of hem-substituted C_5–C_8 alkanes.

In biodegraded oils the concentration of n-alkane C_{10+} notably decreases and in most cases these constituent parts of oil disappear fully. Time and again a-cyclic isoprenoid are not identifiable in biodegraded oils either. The ratio n-alkane vs. i-alkane (applicable for facies which comes to boiling out at less than 350°C) in biodegraded oils is less than 4, whereas in non-maturated samples this value exceeds 10.

In terms of ratios within streranes and terpanes compositions there can be distinguished two groups in biodegraded oils from West Siberia. In the first group there traditionally change [1, 4] correlations between hydrocarbons from sterane and terpane series, alongside with missing n-alkanes and a-cyclic isoprenoids and introduction of 17α(N)-25-norhopanes in the picture. The concentration of 17α(N)-hopanes 22R gets times as higher comparing to 20R steranes, while hopanes vs. C_{29} – C_{32} moretanes ratio decreases, in the mean time there decrease content composition of tri-cyclic terpanes against diminishing progressively hopanes concentrations. These are greatly biodegraded oils [1, 4]. In the second group of oils n-alkanes are missing or low concentrated, and 17α(N)-25-norhopanes are introduced in their content composition. They are moderately bio-degraded oils [1, 4].

So, in Cretaceous reservoirs there are identified oils in various stages of biodegradation, which is seen distinctly in oily HC abundance nature.

REFERENCES

1. Kasirtsev, V.A. (2003) Organic geochemistry of haphthides from the east of Siberian platform. Yakutsk: Yakutsk Sabsidiary of SB RAS Publishing House, p.160
2. Hunt, J.M. (1982) Petroleum geochemistry and geology. Moskow: Mir, p. 703
3. Petroleum-bearing basins and areas in Siberia. Edition 2.West Siberian basin/ Edited by A.E. Kontorovich. Novosibirsk: UIGGM SB RAS, 1994. p. 200
4. Peters, K.E., Moldowan, J.M. (1993) The biomarker guide: interpreting molecular fossils in petroleum and ancient sediments. Prentice Hall, Englewood Cliffs, New Jersey 07632, p.363
5. Rozanova, E.P., Kuznetsov, S.I. (1974) Microflora of oil fields. Moscow: Nedra, p.197.