

GEOCHEMICAL PRECONDITIONS OF OIL-GAS-BEARING CAPACITY OF ANADYR BASIN

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Anadyr Basin is situated in the north-eastern part of Russia, largely within the limits of the Bering shelf and contains more than 8 km of Cretaceous and Tertiary deposits. The regions prospective for oil and gas are connected with minor basin depressions filled by Paleogene - Neogene deposits that have been the object of investigations. At the moment 4 industrial oil and gas fields have been revealed in the basin; semi-industrial HC inflows have been delivered practically from the whole sedimentary sequence – from Cretaceous to Neogene inclusive, that indicates considerable HC potential of the basin.

Variability of facial environments, where the sedimentary sequence of Anadyr basin was formed, has reflected the oil-gas generation potential of these sediments. Rocks with increased oil-source potential are being met throughout the whole stratigraphic sequence. Paleogene deposits are characterized by the following parameters: TOC=0,2-4,2% (mode – 1,04%), generation potential (S_1+S_2) – up to 540 kg HC/t_{rock}, HI=38-329 mg HC/g TOC (mode HI=90 mg HC/g TOC) (tanurersk horizon), TOC – 0,65%, (S_1+S_2) – up to 530 kg HC/t_{rock}, HI=40-320 mg HC/g TOC (mainitsk suite). Taking into account that kerogen is highly catagenically transformed, the initial values of these parameters were higher and OM had higher oil-source potential. TOC and generation potential range in the coal-enriched Neogene sediments (sobolkovsk, gagarinsk, avtatkulsk, telekajsk suites) are varying in wide ranges: TOC from 0,1 to 18% (and more in the coal layers), (S_1+S_2) – from 0,2 to 124 kg HC/t_{rock}.

Peculiarities of Anadyr basin as in the other Cenozoic sedimentary basins of the Far East is absence of good source rock deposits that is determined by initial type of kerogen – influence of humic OM is becoming apparent to a greater or lesser extent in all source rocks of the basin. Rocks of mainitsk suite are characterized by the highest oil-source potential.

Oils and condensates from Paleogene-Neogene deposits have been studied by standard geochemical methods. Oils are usually light, resinous, viscous to non-viscous, lightly sulphurous. Their characteristic feature is very high content of paraffins (up to 25%), uni-modal distribution of n-alkanes, with maximum on C₂₃, C₂₂ and less on C₁₆, harsh prevailing of Pr under Ph, (Pr/Ph=6-13), oils relatively isotopically light ($\delta^{13}C = -27.9 - -28,2\text{‰}$). By relation of alkane HC`s (Pr/nC₁₇, Ph/nC₁₈) initial OM for these oils is generated in the zone of deltaic-lagoon sedimentation conditions. The main source of initial material judging to sharp

prevalence of ethylcholestane C_{29} ($C_{27}:C_{28}:C_{29}=11:20:69$) has been OM of predominantly continental origin. At the same time strata with similar part of continental material have not been observed within the studied region. It is not excluded that initial OM is that of deep horizons of tanurorsk suite (Lower Paleogene) as well as Upper Cretaceous deposits (rarytkinsk suite).

Oils with Pr/Ph ratio more than 10 are rarely met. They are met in some Cenozoic basins of the Pacific belt, for example oils of napansk suite, Western Kamchatka, oils of northern Vietnam, Gippsland basin, Taranaki basin – by initial OM they could be related to one genetic group, although OM is not identical. Oils in all the studied areas are mature – by methylphenanthrene index ($MPI=0,65-0,86$) correspond to the central part of the “oil window” (Powell, McKirdy, 1972).

Relation between maturity of OM of coal-enriched strata and alkane indexes in the oils genetically related to the coal strata is observed in the studied basins – Pr/Ph ratio is increasing with the coal maturation up to the lowermost part of the “oil window”, and sharply decreasing with the following catagenetic transformation (Powell, McKirdy, 1972). Maximal values of Pr/Ph are observed in coaly strata of Mezozoic-Cenozoic age in the lowermost part of the “oil window”. So the main factor that stipulated high Pr/Ph ratio is initial terrestrial coal-enriched matter. Sharp prevailing of Pr under Ph is probably connected with the flora specification characteristic for Late Cretaceous basins of the Pacific belt. Moreover, relatively high maturity level (the lowermost part of the oil window) is apparently increasing part of pristane and stipulates growth of Pr/Ph ratio.

Hence, source rocks in Anadyr basin are present throughout the whole Paleogene-Neogene sedimentary sequence. Miocene and Paleogene source rocks have considerably realized their potential that considerably heightens perspectives of oil- and gas-bearing capacity of the Anadyr basin. Due to high amount of coal strata within the sequence we can suppose that prevailing realized is gas potential, although liquid hydrocarbons have also been generated in the quantities capable to form industrial deposits.

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