

PHASE TRANSFORMATIONS OF HYDROCARBONS IN MAIN ZONE OF OIL FORMATION

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It is known, practically all industrial oil deposits settle down in an earth's crust not more deeply 8 km, forming a maximum in distribution of deposits to depths 2÷3 km. This area of depths has received the name of "oil window" or "the main zone of oil formation (MZOF)". According to the biogenic theory [1], origin MZOF is explained by transformation of died organisms remains, which are immersed with sedimentary rocks into an earth's crust during the basic geological processes.

However at last few years cases of fast formation of the oil fields [2, 3, 4] was found out. This fact is very difficult to explain with positions of the biogenic theory.

With the purpose of an explanation of these facts on fig. 1a, for an example, the phase diagram [5] for typical gas-condensation mix characterised: CH_4 (70-85%), $\text{C}_2\text{H}_6 + \text{C}_4\text{H}_{10}$ (5-10%), C_{8+} (10%) is given at temperatures and pressure in a range of depths 1÷6 km.

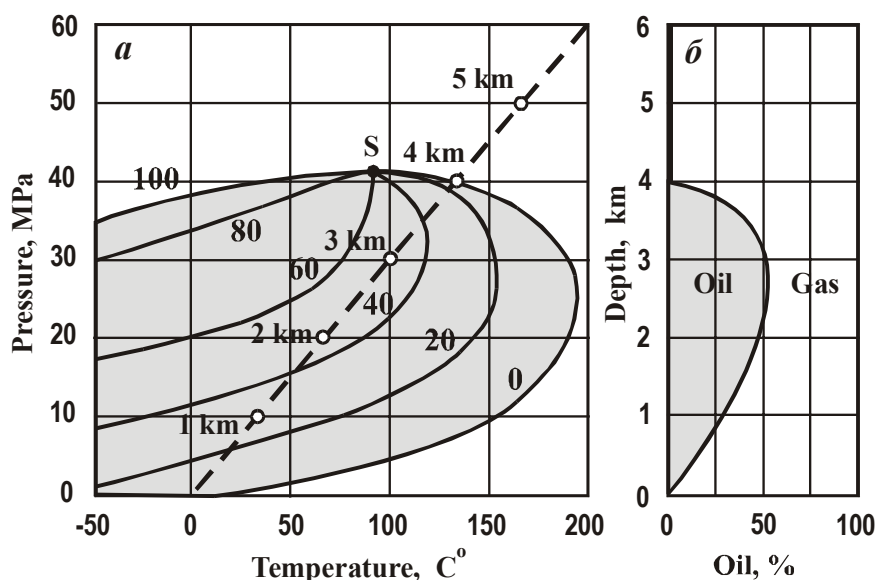


Fig.1. The phase diagram of a hydrocarbons mix (a) and the curve of oil-production corresponded to this diagram (b). Inclined dotted direct is a depths scale; point S is a critical point of a mix

According to calculations [6], outside of the closed area, which is shown on fig.1a by grey colour, the hydrocarbons can exist only in a homogeneous form. Inside this area liquid and gaseous make separate phases. The dotted direct line crossing a phases diagram on diagonal corresponds to change PT-conditions with reduction of depth.

On fig. 1b the configuration of a zone of transformation of hydrocarbons according to the phase diagram (fig. 1a) is shown at their vertical migration from below upwards. In this case gas-condensation deposits may occupy only zone is deeper of 5 km border. On smaller depth there is a disintegration of a homogeneous mix on gaseous – gas, and liquid – oil, phases. Under favourable geological conditions (in this case we mean under them, existence of covers are impenetrable for oil, but penetrable for gas) the liquid phase can form own congestion with an insignificant gas cap on depth is ~1÷5 km. And on depths less than 1 km with softer PT-conditions basically deposits of gas with small oil frontier zone will be placed.

The initial mix of hydrocarbons, owing to decontamination in process of rise to a terrestrial surface, can lose easy low temperature components, and its liquid phase will be enriched by heavy hydrocarbons. Therefore in a case when liquid phase burst open to upwards, she quite can generate accumulations of heavy oils and even bitumen.

Thus, the results of making calculations show that existing of MZOF and her configuration can be explained by phase transformations of hydrocarbons when they get in this zone "from above" with

dead biomass, and when they act here "sideways" and "from below" with underground waters or in result of outgassing of carbon-contained masses immersing more deep.

References:

1. *Vassoevich N.B.* (1986) Geochemistry of organic substance and an origin of petroleum. The selected transactions // Moscow: Nauka Press (In Russia).
2. *Muslimov R.H., Izotov V.G., Sitdikova L.M.* (1999) Influence of a fluid mode of the crystal base of the Tatar arch on regeneration of stocks Pomashkin's deposit // New ideas in sciences about the Earth. Abstract book of IV International Conf. Moscow: MGGA Press. (1), 264 (In Russia).
3. *Smirnova M.N.* Opportunity of modern formation of deposits of petroleum and gas // New ideas in sciences about the Earth // In the same place, 272 (In Russia).
4. *Korchagin V.I.* (2001) Oil-production of the base // The forecast oil-gas-production of the base of young and ancient platforms. Abstract book of International Conf. Kazan: Kazan University Press, 39-42 (In Russia).
5. *Barenbaum A.A., Batalin O.J.* (2001) About phase transformations of hydrocarbons during global geochemical circulation // New ideas in geology and geochemistry of petroleum and gas. Oil-gas geology in XXI century. Part I. Moscow State University Press, 40-42 (In Russia).
6. *Batalin O.J., Brusilovskij A.I., Zakharov M.J.* (1992) Phase of balance in systems of natural hydrocarbons // Moscow: Nedra Press (In Russia).

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