

SIMULATION OF NAFTIDOGENESIS PROCESSES BY BAZHENOV FORMATION ORGANIC MATTER IN TUMEN SG-6 WELL (WESTERN SIBERIA).

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Introduction

The paper results simulation of generation processes associated with the organic matter of the Bazhenov formation in the well Tyumen SG-6. We established occurrence of Bazhenov formation in the main phase of oil generation, phase duration, generation volumes on basis of that model.

Simulation parameters

The investigation is carried on to estimate time of entering the main oil generation zone of the Bazhenov formation and to find out its generation potential in the northern parts of the Western Siberia. One-dimensional modelling is performed in the “Genex” software suite. Structure and lithological model is built up by the well logging data and averaged stratification depths by different authors [2,3]. The clay-sand ratio in sediments is estimated by α -SP logging. Thermal history of sediments is rebuilt based on paleo-day and present-day temperature data in the well [1] and calibrated by up-to-date katagenesis schemes in top of Jurassic sediments [5]. The heat-flow during history of sedimentary cover forming is set variable starting with high value (155 mW/m²) under the formation of tuff-eruptive complex and afterwards it is decreased to constant value (20 mW/m²).

The model of hydrocarbon generation processes by organic matter (OM) from the Bazhenov formation (3782-3845 m) is built up based on the above-mentioned data. Pyrolysis data (Tmax, HI, materials from V.N.Melenevsky) indicated high degree repeatability of measurement with model constructions. Geochemical data bear evidence that OM in formation is aquagene [2] (II-nd type kerogen from “Genex” database). The initial content of organic carbon is estimated by formula [4]:

$$TOC^0 = TOC / (1 - (TR * HI^0 * 0,83^{-3}))$$

TOC⁰ – initial content of organic carbon (%),
 TOC – content of organic carbon at present (%),
 TR – transformation rate (unit fraction),
 HI⁰ – initial hydrocarbon index (mgHC/gTOC).

It was found that average TOC at present is 5,03%. HI⁰ is taken with reference to model data for II-nd type kerogen – 627 mgHC/gTOC. TOC⁰ in conformity with formula – 8,04%. TR estimated with model data is equal 0,725.

Results

The variation in time of liquid and gaseous hydrocarbons, that was formed by the Bazhenov formation OM in Tumen SG-6 well, is represented on Figure 1. The bottom of the Bazhenov formation had entered the main oil generation zone at depth 2800 m at the beginning of late Cretaceous (approximately 92,9 Ma) at a temperature of 116°C. Predominantly, the liquid

hydrocarbons generation had place. Every km² of source rock had generated approximately 2440 thousand tons of liquid hydrocarbons per Ma during late Cretaceous. There is leap to 4000 thousand tons per Ma in Paleocene and tendency of rising continues for approximately 50 Ma.

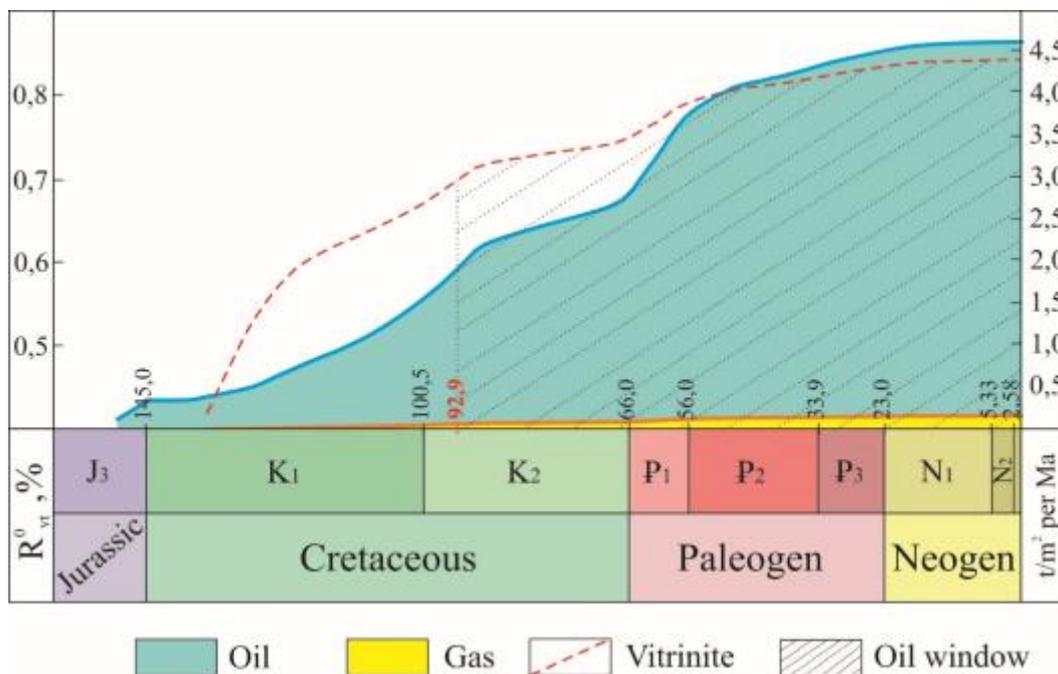


Figure 1 Accumulative generation of liquid and gaseous hydrocarbons by Bazhenov formation OM in Tumen SG-6 well.

When analyzing the model of hydrocarbon generation by Bazhenov formation OM in Tumen SG-6 well it can be assumed that a slight increase of liquid hydrocarbons productivity may take place in the future. The stated above is possible because of source rock still belong to the main oil generation zone ($R_{0vt} \sim 0,8-1,0 \%$). In addition, it should be noted that similar volumes of hydrocarbons generation can be expected in areas where formation still entering oil window.

References

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