

Authigenic dolomite of Bazhen source successions as an indicator of the final stage of hydrocarbon generation

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Abstract

Petrographic observations, substantiated by the X-ray phase examinations, have revealed dissimilar character of the secondary dolomite development within the highly bituminous rocks of the Bazhenov formation. The mineral in question has not been found in any dry holes. In the low- and medium-flow-rate wells (160-2160 tons per day), it, alongside with other minerals, is more or less uniformly distributed in the principal bituminous mass, impregnates it, producing a peculiar 'starry arch' pattern in thin rock sections. In case of high oil influxes (more than 80 tons per day), the amount of newly formed dolomite rises sharply, its nature and localization character alter. It is important to emphasize, that the dry holes are maximally remote from the faults, and the most productive well has been drilled directly within the tectonic dislocation zone. The rest of the low- and medium-flow-rate wells occur in the intermediate positions relative to the faults. Productivity of the Bazhenov Formation and generation of authigenous dolomite are controlled by the rock heating degree. Increased temperatures (at about 200°C) are required for normal dolomite generation. Within the settings of tectonohydrothermal activation of the Western Siberian Plate, hydrocarbon generation in the oil and gas source rocks occurs under the following temperatures: oil - from 60 to 170°C, oil + gas condensate - from 150 to 200°C). The investigation results show that the algal authigenous dolomite from the Bazhenov formation has not resulted from diagenesis; it has originated autonomously, due to heating of the highly bituminous, Mg and Ca comprising rocks. The absence or the presence of algal dolomite in situ indicates whether the highly bituminous source series of the Bazhenov Formation has been subjected to the stage of final hydrocarbons generation or not. The areas with the occurrences of algal authigenous dolomite should be regarded as the areas of intense (final) hydrocarbons generation by the Bazhenov deposits.

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