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Hydrocarbon degassing of the earth and origin of oil-gas fields (isotope-geochemical and geodynamic aspects)

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More than half a century ago, Academician PN Kropotkin substantiated the relationship of the formation and distribution of oil and gas fields with the processes of emanation hydrocarbon degassing of the Earth. Over the years, the concept of PN Kropotkin received further development and recognition of studies based on new factual material. Of particular importance are the following factors: a) the results of studies on global and regional uneven processes of traditional oil and gas and the role of deep faults in controlling the spread of oil and gas fields; b) the results of the research on gigantic volumes and localization of the discharges of hydrocarbon fluids (mud volcanoes, seeps) on land and into the atmosphere and through the bottom of the World ocean; c) the results of the studies on grand volumes of the spread of unconventional hydrocarbon resources in their non-traditional fields, especially on near-surface interval of unconventional oil and gas accumulation with gas hydrates, heavy oil and bitumen, as well as extraordinary resources of oil and gas in the shale and tight rocks.
Deep mantle-crust nature of oil and gas in traditional and nontraditional deposits thus received further substantiation of geological and geophysical data and research results. However, isotopic and geochemical data are still interpreted in favor of the concept of the genesis of oil and gas in the processes of thermal catalytic conversion of organic matter of sedimentary rocks, at temperatures up to 200°C.
In this report an alternative interpretation of the isotope carbon-hydrogen system (δ13C-δD) for gas and of oil deposits, isotope carbon system for methane and carbon dioxide (δ13C1-δ13C0) will be presented. An alternative interpretation will also be presented for the data on carbon-helium isotope geochemical system for oil and gas fields, volcanoes and mud volcanoes. These constructions agree with the geological data on the nature of deep hydrocarbon fluids involved in the formation of traditional and nontraditional hydrocarbon accumulations. The genesis of hydrocarbon fluids turn up to be associated with a hydrocarbon branch of deep degassing and recycling of crustal materials and processes of crust-mantle interaction [1,2,3].
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