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Identification of triamantanes (C_{18}–C_{19}) and tetramantanes (C_{22}) in crude oils and geochemical significance of C_{10}–C_{22} diamondoids

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Abstract

Diamondoids has a characteristic mass-spectra using a gas chromatography-mass spectrometry (GC-MS) for their analysis. Their characteristic ions are *m/z* 136, 135, 149, 163, 177 (for adamantanes C_{10}-C_{14}), *m/z* 188, 187, 201 (for diamantanes C_{14}-C_{16}), *m/z* 240, 239 (for triamantanes C_{18}-C_{19}) and *m/z* 292 (for tetramantanes C_{22}). At the same time our investigations have been shown that often there are many foreign peaks at the diamondoids mass-chromatograms. These foreign peaks elute together with diamondoids at the same retention time. Since there is no published data on the diamondoids retention indices the correct identification of these hydrocarbons is difficult. At present time adamantanes and diamantanes are more studied than triamantanes and tetramantanes. It can be possible because their relative concentrations in crude oils are considerably higher than triamantanes and tetramantanes ones.

As has been mentioned above triamantanes and tetramantanes are less studied than adamantanes and diamantanes. Nevertheless despite the presence of many foreign peaks at the *m/z* 240, 239, 292 and 291 mass-chromatograms we recently identified triamantanes and tetramantanes. For this purpose we used method of thermal-diffusion separation of saturated fractions of oils and isomerization of saturated concentrates with alumosilica catalyst. We determined the retention indices of triamantane (C_{18}), 9-methyltriamantane (C_{19}) and all isomers of tetramantane (C_{22}) (iso-, anti- and skew-). The report will present their mass-chromatograms.

Distribution of triamantanes and tetramantanes in crude oils studied poorly but we have found that their distribution in oils of various genotypes are different. Thus distribution of triamantanes and tetramantane can be used like admantane, diamantane and triamantane in geochemical investigations. According to our studies the distribution of C_{10}–C_{22} diamondoids can be used for correlations biodegradated and unbiodegradated crude oils.

Biography

Guram N. Gordadze is a Doctor of Geological and Mineralogical Sciences and Candidate (PhD) of Chemical Sciences, professor, member of the Russian Academy of Natural Sciences, a laureate of numerous awards, such as the Academician Gubkin Prize (2011), Vernadsky Prize (2010), etc. Head of the Laboratory of Chemistry of petroleum hydrocarbons (Department of Organic Chemistry and Petroleum Chemistry of the Gubkin Russian State University of Oil and Gas). Member of Scientific Councils of the Gubkin Russian State University of Oil and Gas and VNIIgeosystem. A member of editorial board of the journal «Petroleum Chemistry». Author of over 300 scientific publications. The areas of my research interests are the origin of petroleum, oil and gas exploration and reservoir geochemistry, the study of biomarkers and cage hydrocarbons (diamondoids), modeling of oil formation.