

METHODOLOGY FOR THE IDENTIFICATION OF OIL DIAMONDOIDS

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The diamond-like hydrocarbons (diamondoids) with a location of carbon atoms in its molecules like in diamond crystal cell are nanoscale compounds and in the scope of interest for geochemists. Recent studies (including ours) showed that relationships of diamondoids distribution could be used for the correlation in oil–oil and oil–dispersed rock organic matter systems etc. although diamondoids are not biomarkers [1–6].

It is very important for geochemists that diamondoids have such unique properties as thermal and biodegradation stability. It is known that during maturation of organic matter the informational content (informative value) of sterane and terpane indexes falls on the one hand due to achievement of equilibrium between some biomarkers and on the other hand due to reduction of absolute concentration of biomarkers to the minimum values. Moreover the biomarkers are usually absent in condensates (light oils). In the same time diamondoids because of their stability retain in the system and may be used in addition to (or instead of) traditional biomarkers [1–6].

The identification of diamondoids is impeded by presence of non-diamondoid compounds on mass-chromatograms with the same characteristic ions. Our preliminary investigations have shown that these unknown compounds are precursors of diamondoids (or are protodiamondoids) [7,8]. And whereas protoadamantanes and protodiamantanes are absent in some petroleum (usually in petroleum of continental origin) the prototriamantanes and prototetramantanes are present in virtually all crude oils. It is very difficult or impossible to analyze triamantanes and tetramantanes. More than that on triamantane mass-chromatograms (m/z 240) we have identified the n-heptadecane which molecular mass (240) coincides with the molecular mass of triamantane. At the same time on the mass-chromatograms of mono-substituted triamantanes (m/z 239) we have identified homologous series of n-alkanes from n-octadecane (C_{18+}). All mentioned above makes it very difficult to determine triamantanes.

We have developed the methodology of diamondoids identification in petroleum and condensates (light oils). It is based on thermal diffusion concentration of polycyclic saturated hydrocarbons from paraffin-cycloparaffin fractions of oils followed by isomerization in presence of acid catalysts. Using this methodology we identified the triamantane, mono-substituted triamantanes, all isomers (iso-, anti-, skew-) of tetramantane and mono-substituted tetramantanes.

It is obviously that diamondoids with higher molecular mass (pentamantanes, hexamantanes etc.) can be identified based on presented us methodology too.

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