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BIOMARKER OCCURRENCE IN NATURAL GASES AND ITS POTENTIAL SIGNIFICANCE IN GEOCHEMISTRY

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The present study deals with a novel approach that can concentrate trace liquid hydrocarbons from natural gases of a production gas well *in situ* by using a specifically-designed glass absorption column, which is half-filled with a variety of solid absorbents. Then the absorbent is desorbed with normal organic solvent in a common extraction procedure within lab. Liquid hydrocarbons with a wide range of carbon numbers (C_{11}-C_{35}) are detected out in the solute from these absorbents by means of GC analysis. Besides normal paraffins, naphthenes, isoprenoids and some biomarkers, such as tricyclic terpanes, pentacyclic triterpanes and steroids, are also discovered in the solute by means of GC-MS.

In addition, a comparison among different absorbents, such as aluminium oxide, silica gel, activated charcoal, 5Å molecular sieve and 13X molecular sieve, is made in the study and the result has shown that all the absorbents are of good absorption nature to trace liquid hydrocarbons when they are in a constant natural gas flow for a certain time. Generally, aluminium oxide and silica gel have an advantage over the rest of tree other absorbents due to their indiscriminating absorption and comparatively easy desorption while charcoal, though excellent in absorption, is hard to be completely desorbed, and 5 Å and 13-X molecular sieves are not recommended due to their discriminating absorption or uncommon use in lab.

Some studies including the present one have showed that there exists a tiny amount of liquid hydrocarbons (C_{15+}) in natural gases, even in an overmature dry gas whose drying coefficient (C_1/C_{1-5}) is equal to or greater than 0.99. These trace liquid hydrocarbons are believed to be composed at least of n-paraffins, naphthenes, isoprenoids and some biological fingerprint compounds which could be of potential in a wide application in gas geochemistry. For instance, it may be possible to construct a direct linkage among different physical phases in gas geochemistry, namely the gaseous phase (natural gas), liquid phase (its upstream precursor for a thermally cracking gas and solid phase (its possible source rock) in terms of biological fingerprint compounds if these biomarkers, though in a tiny amount, can be detected out from natural gases.

It is well known that condensates are commonly associated with either natural gases or normal oils and they are widely used in petroleum and gas geochemistry. Generally condensates are composed mainly of normal paraffins and naphthenes and in most cases owing to their trace amounts compared with n-paraffins and naphthenes, typical biological fingerprint compounds, such as tricyclic terpanes, pentacyclic terpanes and steranes, are hard to be detected out in condensates unless they are pretreated by complexation. Interestingly, it is found that these biomarkers do exist in natural gases and are detectable without complexation. Taking the natural gas from Well Shaan-81, Ordos Basin in China as an example, the authors concentrated liquid hydrocarbons from the natural gas produced from this well and detected out a series of biological fingerprint compounds in the solute desorbed from the absorbent applied, however, none of them was detectable in the condensate associated with the same gas from the same well. It may be implied that biomarkers in natural gases are of certain geochemical significance in gas geochemistry and exploration. However, it has a long way to go before biomarkers in natural gases can be fully understood and applied in gas exploration as well as in gas geochemistry.

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