

Detection and application of sterane and terpane in natural gas

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Sterane and terpane are important and effective biomarkers of hydrocarbon generating material, source rock evolution history, paleo-sedimentary environment and hydrocarbon migration. They can offer information about hydrocarbon source rock, hydrocarbon migration and accumulation and hydrocarbon alteration. However, the sterane and terpane are very low in natural gas and affected significantly by sample collection, sample preservation and pretreatment and contamination. Freezing method is the best detection method of sterane and terpane with little contamination, simple process and little gas. Analysis on the experiment results indicates that C_{19} tricyclic terpane/ C_{23} tricyclic terpane and C_{26} tricyclic terpane/ C_{24} tetraterpane are effective indexes which can indicate organic matter of source rock. C_{19} tricyclic terpane refer to higher plants, while C_{23} tricyclic terpane indicates marine organic matter. Higher value of C_{19} tricyclic terpane/ C_{23} tricyclic terpane indicates that the organic matter of source rock is higher plant. C_{24} tetraterpane may indicate the source rock is related with carbonate or evaporate. C_{19} tricyclic terpane/ C_{23} tricyclic terpane is high in coal gas. C_{19} tricyclic terpane/ C_{23} and C_{26} tricyclic terpane/ C_{24} tetraterpane are both low in natural gas derived from marine carbonate. The higher the value of C_{27} sterane, the better the type of organic matter of source rock is. C_{27} sterane is low (about 15%) in coal gas and high (about 25%) in natural gas derived from marine carbonate or other type I organic matter. The isotope, sterane and terpane of natural gas samples of known source are tested. They refer to the same organic matter of source rock. In all, sterane and terpane are effective indexes of gas source correlation.

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Sulfur dioxide: A nice recoverable inorganic tool for the construction of bioactive compounds

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After burning dry grass and wood that produces CO_2 , man discovered Ca. 8000 years ago in Sicily, that burning sulfur in jars lead to food and beverages preservation. Although SO_2 has been with us for very long its use in organic chemistry has led thus far to very few applications. We have invented a new organic chemistry based on the hetero-Diels-Alder and hetero-ene-reactions of SO_2 . The catalyzed hetero-Diels-Alder reaction of SO_2 leads to unstable sultines which are formed faster than the more stable isomeric sulfolenes known since 1914. Using 1-alkoxy or 1-silyloxy-1, 3-dienes, the sultines are not seen at low temperature, but are formed as intermediates that are ionized into the corresponding zwitterions (Umpolung with SO_2). The latter react with electron-rich alkenes giving the corresponding silyl sulfinates. After desilylation, retro-ene elimination of SO_2 the β , γ -unsaturated sulfinic acids generate polypropionate fragments 5 that contain up to 3 contiguous stereogenic centers, this in one-pot procedures. The new reaction cascade has led to very efficient (fewer steps) total, asymmetric syntheses of Ryfamycin S, Baconipyron, and Apoptolidin A, and the first (and very short) total synthesis of (-)-Dolabriferol. Polypropionate fragments containing up to ten contiguous stereogenic centers have been obtained in a few steps. Our reaction cascade permits the one-pot, four component synthesis of polyfunctional sulfones and sulfonamides. New reagents for the silylation of hydroxyl groups of unstable aldol, for the selective silylation of carbohydrates, phenol and carboxylic acid have been invented also, as well as a new one-pot direct amidification of carboxylic acids.

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