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ENRICHMENT OF STERANES AND HOPANES BY MOLECULAR SIEVE NAX AND CAX FOR COMPOUND SPECIFIC ISOTOPE ANALYSIS

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Compound Specific Isotope Analysis (CSIA) is a useful method in geochemistry, it can be used for reconstruction of paleoenvironment (Summons and Powell, 1987) and oil-oil and oil-source rock correlation (Guthrie et al., 1996). To carry out CSIA accurately, analysis of the entire peak without co-elution of other compounds is required, and during preparative separation of organic compounds without isotopic fractionation of individual compounds is also necessary (Bidigare et al., 1991). Molecular sieves are shape-selective separation materials which have no fractionation effect during separation of organic compounds (M.Schoell et al., 1992, Kening et al., 2000, Moldowan and Dahl, 2004). In this study, we establish a method using column chromatography packed with molecular sieve NaX and CaX to separate hopanes and steranes, and biomarkers CSIA can be realized.

The procedure of the method includes the following main steps:

1) Silica gel is used for separation of saturated hydrocarbon from crude oil or source rock extract.

2) Molecular sieve ZSM-5 is used for remove of n-alkanes from saturated hydrocarbon, and the branched and cyclic fractions are obtained.

3) Place the branched and cyclic fractions on the top of glass column filled with molecular sieve NaX, use pentane to rinse it till it wets half of the column.

4) Rinse the column with pentane after 30 minutes. Collect the pentane elution and concentrate it in a rotate evaporator.

5) Dry the column with N_2. Pour out the molecular sieve NaX and extract it with isooctane in a small type of Soxhlet extractor for more than 30 hours. The hopanes are obtained, as shown in Figure 1 A0.

6) Place the concentrated elution got from step 4) on the top of glass column filled with molecular sieve CaX, use pentane to rinse it till it wets half of the column.

7) Rinse the column with pentane after 30 minutes. Collect the pentane elution 5 cuts. Steranes of different configurations and gammacerane, β-carotane are separated or enriched, as shown in Figure 1 A1 to A5.

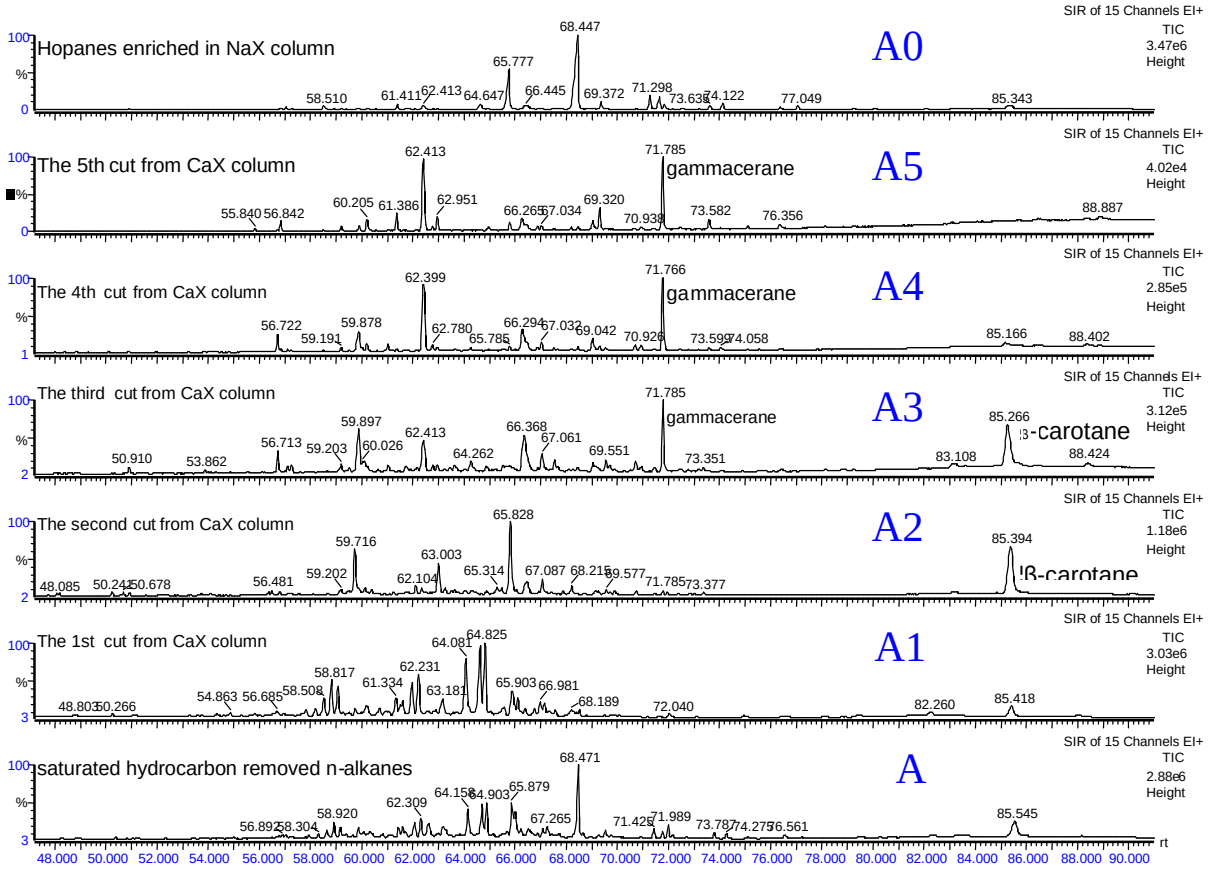

Figure 1. Total ion chromatogram for each fraction by GC/MS.A-saturated hydrocarbon removed n-alkanes, A1-A5, each 3ml elution from molecular sieve CaX, A0-hopanes enriched in molecular sieve NaX.

Compounds are identified by interpretation of mass spectral data and comparison with available standards and data in the literature. Compound Specific Isotope Analysis in fraction A0-A5 can be carried out by GC-C-MS.

REFERENCES

Summons,R.E. and Powell,T.G. Identification of aryl isoprenoids in a source rock and crude oils:biological markers for the green sulphur bacteria. Geochimica et Cosmochimica Acta, 51, 557-566,1987

Guthrie,J.M.,Trindade,L.A.F.,Eckardt,C.B.and Takaki,T Molecular and carbon isotopic analysis of specific biological markers:evidence for distinguishing between marine and lacustrine depositional environments in sedimentary basins of Brazil. Presented at the Annual Meeting of the American Association of Petroleum Geologists,1996,San Diego,CA.

Kenig , F. , Popp,B.N. and Summons,R.E. Preparative HPLC with ultrastable-Y zeolite for compound-specific carbon isotopic analyses. Organic Geochem.,2000,31,1087-1094.

Moldowan J.M.and Dahl J., presented at the Abstract of AAAPG meeting, 2004, Beijing, China

M.Schoell, M.A. McCaffrey, F. J. Fago, and J. M. Moldowan, Carbon isotopic compositions of 28,30-bisnorhopanes and other biological markers in a Monterey crude oil. Geochimica et Cosmochimica Acta, 56, 1391-1399, 1992