

A NEW METHOD FOR PURIFYING FATTY ACIDS FROM SEDIMENTS

Wen Qi^{1,2}, Yanqing Xia¹, Jiang Chang¹

1. Research Institute of Petroleum Exploration and Development-Northwest, Petrochina, China

2. Key Laboratory of Petroleum Resources Research, Institute of Geology and Geophysics, Chinese Academy of Sciences, China;

Introduction

Fatty acid in sediment, as an important hydrocarbon generating material, can provide abundant and effective geochemical information which often indicates the hydrocarbon source, maturity, and biodegradation, as well as hydrocarbon migration. Among the many methods for purifying fatty acid, saponification extraction and column chromatography are the most classic. While a large number of experiments have shown that both methods cause a mass of fatty acid loss, especially the long-chain one, resulting in artificial changes of the composition of fatty acid series. In this paper, a new purification method is developed to raise the recovery of medium and long chain fatty acid. Qualitative and quantitative comparison of fatty acid taken by new method, saponification extraction and column chromatography, the results show that the carbon number range of fatty acid significantly expands by using new method, and long-chain fatty acid content presents a dozen times growth.

Methods

- (1) Grinding the peat sample to 100 mesh, then extracting in a soxhlet extractor with chloroform for 72 hours.
- (2) Concentrating the extracts with a rotary evaporator.
- (3) Eluting the weak polar components of the concentrate obtained on step 2 with 150 millilitres dichloromethane through a silica gel column (silica gel: alumina = 3: 1).
- (4) Taking out the packing of the silica gel column, dissolving with HF (20%), then extracting with chloroform.
- (5) Concentrating the extracted solution of step 4 by rotary evaporation, and then methylating with 10 millilitres boron trifluoride methanol solution (14%) at 70C° for 1 hour.
- (6) Eluting the produce of step 5 with 150 millilitres dichloromethane through a new silica gel column (silica gel: alumina = 3: 1).
- (7) Concentrating and constant weight the fatty acid methyl ester obtained on step 6, then analysing by GC/MS.

Saponification^[1] and column chromatography^[2] have been reported in the references.

Results

Figure 1 shows the peak pattern distribution of fatty acid through the three different methods. By saponification and column chromatography only detect C₁₄-C₂₈ monounsaturated fatty acid whose main peak is C₁₆, and rarely find dicarboxylic fatty acid. While using the new method, the C₁₄-C₃₂ monocarboxylic fatty acid and C₁₅-C₂₇ dicarboxylic fatty acid are detected, and the main peak of the monocarboxylic fatty acid shifts to C₂₆.

The results also present the difference in fatty acid composition obtained by the three methods. The fatty acid extracted by the new method, both single and total, show multiple times or even dozen times of growth, especially medium and long chain fatty acid.

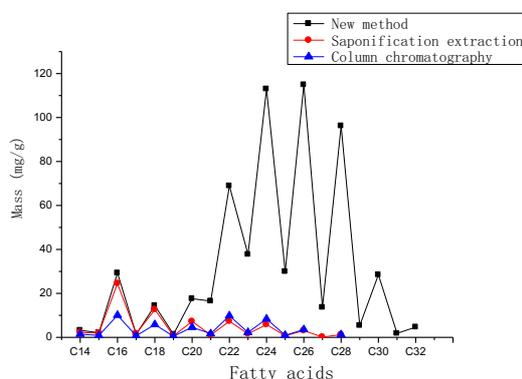


Figure 1 Quantitative comparison of monocarboxylic acids in extracts by different methods

Conclusions

Utilizing the new method can release the middle and long chain fatty acid which cannot be eluted out of the pores or gaps of the silica gel particles, thereby extremely avoiding the loss, the original composition of the fatty acid series in the sample would be intactly reserved. Thus, comparing to the traditional approaches, the new method for getting fatty acid gets great qualitative and quantitative improvement, and provide reliable experimental data for the application and research of fatty acid.

References

- [1] Tommaso T, Igor S, Gustaf H, Oleg D, Peter K, Orjan G. Composition and fate of terrigenous organic matter along the Arctic land–ocean continuum in East Siberia: Insights from biomarkers and carbon isotopes. *Geochim Cosmochim Acta*, 2014, 133:235–256
- [2] Mitsugu ishimur, Makoto Shimokawara, Takahiro Watanabe etc. Efficient GC/MS analysis of hydroxy lipid compounds from geochemical samples using tertiary-butyldimethylsilyl etherification. *Organic Geochemistry*, 2006, 37:1019-1035.