质谱学报 2010 31 (1): 18-27 ISSN: 1004-2997 CN: 11-2979/TH

“创刊30周年”专栏

全二维气相色谱/飞行时间质谱对饱和烃分析的图谱识别及特征

王汇彤[1，2，3];翁娜[1，2];张水昌[1，2，3];陈建平[1，2，3];魏彩云[1，2]

1.中国石油勘探开发研究院，地质实验研究中心，北京100083 2. 中国石油股份公司油气地球化学重点实验室，北京100083 3. 提高石油采收率国家重点实验室，北京1000831.中国石油勘探开发研究院，地质实验研究中心，北京100083 提高石油采收率国家重点实验室，北京100083

收稿日期 修回日期 网络版发布日期:

摘要 采用全二维气相色谱/飞行时间质谱分析方法对典型石油样品中饱和烃组分进行了定性分析，依据极性大小和环数多少的分布特征，解析了点阵图谱中的烷烃、单环烷烃、双环烷烃、单金刚烷和双金刚烷系列、三环萜烷类、甾烷类和藿烷类等生物标志化合物的识别；讨论了典型生物标记化合物单金刚烷、三环萜烷和藿烷类的全二维点阵谱图特征；检测到过去GC/MS分析中常被忽视的C_{31}~C_{35}三环萜烷，为石油地质实验和研究提供了参考依据。全二维气相色谱/飞行时间质谱相比于GC/MS灵敏度更高、峰容量更大，适合复杂混合物体系的分析，对石油样品的分析有很好的应用前景。

关键词 全二维气相色谱 飞行时间质谱 饱和烃 三环萜烷 石油地质

分类号

Characteristics and Identification of Saturated Hydrocarbons by Comprehensive Two-Dimensional Gas Chromatography Coupled to Time-of-Flight Mass Spectrometry

WANG Hui-tong[1，2，3];WENG Na[1，2];ZHANG Shui-chang[1，2，3]; CHEN Jian-ping[1，2，3];WEI Cai-yun[1，2]

1.Petroleum Geology Research and Laboratory Center, Research Institute of Petroleum Exploration and Development, CNPC, Beijing 100083, China; 2.The Key Laboratory of Petroleum Geochemistry, CNPC, Beijing 100083, China; 3.State Key Laboratory of Enhanced Oil Recovery, Beijing 100083, China

Abstract A method for the analysis of saturated hydrocarbons in crude oil was established by comprehensive two-dimensional gas chromatography coupled to time-of-flight mass spectrometer(GC×GC/TOFMS). All compounds were identified according to their family characteristics and each spectrum. Alkanes， cyclic alkanes， bicyclic alkanes， adamantanes， diamantanes， terpanes， steranes and hopanes are separated into easily recognizable bands in the GC×GC chromatogram. The characteristics of terpanes， hopanes and adamantanes’ contour chromatogram are defined. C_{31}—C_{35} tricyclic terpanes were often neglected in the past. Provide petroleum geological experiment workers reference to carry out their work on GC×GC/TOFMS. Compare with the GC/MS, GC×GC/TOFMS has higher sensitivity and bigger peak capacity, which is more suitable for the analysis of complex mixture systems. It will be a helpful tool in the petroleum geological experiment.

Key words comprehensive two dimensional gas chromatography (GC×GC) _ time-of-flight mass spectrometry (TOFMS) _ saturated hydrocarbons _ tricyclic terpanes _ petroleum geological

DOI

通讯作者