# Utility of comprehensive GCXGC-TOF MS in elucidation of hydrocarbon biomarkers

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**Abstract:**
Gas chromatography–mass spectrometry (GC–MS) has been a longstanding principal technique for investigating hydrocarbon biomarkers in geological samples. Considering the significance of biomarkers in geochemical analysis, it is essential to assess them accurately using this technique. However, due to the plethora of peaks and co-elution phenomena, many compounds remain undetected and even go unnoticed in traditional GC-MS, especially those with lower abundances. Additionally, lower sensitivity and resolution reduce the peak capacity of 1D GC-MS, which often produces large areas of unresolved complex mixtures (UCM) resulting in inaccessibility of desired information. The comprehensive two-dimensional gas chromatography time-of-flight mass spectrometry (GC×GC-TOFMS) overcomes the limitations of 1D GC-MS and provides impressive results to form a precise dataset of hydrocarbon biomarkers. The proficiency of the GC×GC-TOFMS will be discussed on different geological samples including crude oils, coal and hydrocarbon source rocks. Several co-eluting peaks in the chromatograms obtained from 1D GC-MS analysis are well resolved and the compounds having scarce abundance are easily detected in the GC×GC analysis. Further, the Py-GC×GC-TOFMS offers fascinating results and aids in understanding protein preservation in million-year-old fossilised samples.

Briefly, the excellent capability of GC×GC-TOFMS in deconvoluting co-eluting peaks could be exploited for the comprehensive characterisation of complex natural constituents, which can provide new avenues in the palaeobiological studies and hydrocarbon exploration.