

## **Advanced Geochemical Technologies (AGTs): A Revolution in Organic Geochemistry**

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Petroleum exploration is all about creating prospects that can yield new discoveries. While classical geochemical technologies such as isotopes of oils and oil fractions and biomarkers are extremely useful, they have already been applied to most of the basins in the world and therefore, are unlikely to yield many new exploration ideas. New geochemical techniques can provide crucial information that was previously unobtainable.

Quantitative diamondoid analysis (QDA) is used for determining the maturity of any oil sample in both conventional and unconventional applications. The high degree of accuracy needed for application of this method is achieved by spiking the liquids with deuterated diamondoids before GCMS analysis. More recently, the ability to perform source correlations by using diamondoids has been developed. These correlation methods have an advantage over all others due to the thermal stability and recalcitrancy of diamondoids toward biodegradation. Thereby, all bitumen and oil samples (condensate, biodegraded oil, black oil) can be correlated by diamondoids. One method (called QEDA) is based on quantitative analysis of large diamondoid molecules ranging from tetramantanes to pentamantanes to cyclohexamantane, which occur in several isomeric structures that can be displayed in a similar fashion to biomarker fingerprints. A second approach is to measure the diamondoid C-isotope ratios. The structural diversity and isotopic ratios of diamondoids are set in the source rock making them useful for correlation.

Compound specific isotope analysis of biomarkers, an AGT for determining geological provenance and oil and extract correlations, will also be discussed in the presentation.