

New Insights into Source and Maturity of Sedimentary Organic Matter from the Vulcan Sub-Basin (Timor Sea) Using Stable Isotope Ratios of Individual Hydrocarbons

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Recent work demonstrates the use of delta values of sedimentary hydrocarbons (n-alkanes, pristane and phytane) to evaluate the maturity of marine source-rocks from the Perth Basin (Western Australia). Distinct deltaD signatures were observed for immature source-rocks (%Ro = 0.53) where pristane (Pr) and phytane (Ph) were significantly depleted in deuterium (D) relative to the n-alkanes. With increasing maturity (up to %Ro = 1.13) the difference between the deltaD values of n-alkanes and isoprenoids reduces as Pr and Ph become progressively enriched in D. The enrichment of D in isoprenoids was attributed to isotopic exchange associated with thermal maturation.

This work has been extended further to a series of highly-matured sediments (%Ro = 0.6–1.6) from the Vulcan Sub-basin (Timor Sea), where the deltaD values of n-alkanes and isoprenoids show similar trends to those observed in the Perth Basin and indicate that D-enrichment in isoprenoids continues at much higher maturities. Further work is being carried out on additional sediment extracts from the Vulcan Sub-basin, to enable a detailed comparison of the isotopic profiles. Crude oils from this region have also been studied to evaluate their source and thermal maturity, adding new ideas on exploration plays and enhancing previous studies at this locality based on molecular and carbon isotopic analysis. In addition, these new isotopic results may be used in conjunction with molecular parameters to provide insights into migration pathways.