VARIABILITY OF MOLECULAR SOURCE AND THERMAL MATURITY INDICATORS IN A MARINE-INFLUENCED COAL SEAM: THE GRETA SEAM, SYDNEY BASIN

S. C. George and J. W. Smith

CSIRO Petroleum, PO Box 136, North Ryde, NSW 1670.

The Permian Greta seam, northern Sydney Basin is a classic example of a marine-influenced coal. Vitrinite reflectance decreases by 0.25% R₀ and fluorescence intensity increases markedly towards the roof. Such vitrinite reflectance suppression is related to the increasingly perhydrous nature of vitrinite in the coal where it is affected by the marine transgression. Vitrinite reflectance is inversely proportional to the H/C atomic ratio, suggesting that the observed suppression is caused by the more perhydrous nature of vitrinite in marine-influenced coals. The distribution of aliphatic hydrocarbons through the seam is very variable and relates to the extent of the marine influence, with a direct contribution of marine-derived lipids and/or bacterial re-working of the peat. The marine influence can clearly be distinguished in the top metre of the seam by depleted amounts of n-alkanes with a lower carbon preference index and a slightly bimodal distribution, a lower pristane/phytane ratio and considerably more hopanes and diasteranes. These geochemical parameters indicate bacterial re-working of the newly deposited peat and a direct contribution of marine-derived lipids at the top of the seam. Aromatic hydrocarbons also show considerable variation through the seam. In particular there are very high amounts of retene at the top of the seam, both in absolute and relative terms. In the Greta seam this compound is probably derived from bacterial terpenoids rather than from higher plant resins. There is also a clear influence of source on the methylphenanthrene index (MPI; Figure 1) and other aromatic maturity indicators, with higher amounts of 2-methylphenanthrene at the top of the seam due to hydrogen-rich organic matter. This results in significantly greater MPI values in the most suppressed samples and confirms that calculated reflectance may be anomalous when assessing the maturity of sediments with variable types of organic matter input. An additional outcome of this work is that the oil-generative potential of humic coals is shown to be enhanced where they are marine-influenced.