

# **Oil from Late Permian Coals in the Sydney Basin, Australia: A Geochemical Study**

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The oil generation potential of coals in the southern Sydney Basin has been examined using organic petrography, molecular geochemical and stable carbon isotopic compositions. Six coals from the Late Permian Illawarra Coal Measures, and six oil shows/seeps hosted mainly in Early Triassic sandstones were analysed. Minor to moderate levels of biodegradation have altered some of the oil and coal samples, but this did not significantly affect the biomarker distributions. Aromatic land plant markers are consistent with the Permian age of the coals and are similar for both oils and coals. The oil shows and seeps were sourced from terrestrial higher plant dominated organic matter (high relative abundances of pristane, C19 and C20 tricyclic and C24 tetracyclic terpanes and C29 regular steranes and diasteranes). High relative abundances of C29, hopane and significant amounts of C30 30-norhopane, 2-methylhopanes and 29,30-bisnorhopanes in two oil shows and three of the coals are unusual. Although these biomarkers could indicate the migration of traces of allochthonous hydrocarbons produced from a calcareous facies interbedded within the Coal Measures, a more likely alternative is that they represent a particular organic facies within some of the coals. Similarities of biomarker signatures, carbon isotopic compositions and thermal maturities of the oils and the Permian coals (1.0 to 1.4 % vitrinite reflectance equivalent) indicate a genetic relationship between the oil shows/seeps and coals. This provides evidence for generation of petroleum hydrocarbons from the Illawarra Coal Measures, and its subsequent migration into the overlying Early Triassic sandstones.