

AN INSIGHT INTO THE OIL-EXPULSION CHARACTERISTICS OF COALS FROM A SUITE OF COMPOSITIONALLY RELATED NEW ZEALAND COALS

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Although it is now recognised that coals may generate oil (Killops et al. 1998 and references therein) – usually highly paraffinic – the questions of precise petroleum potential and expulsion efficiency remain and are addressed in this study.

Coals are known to have high absorption/adsorption capacities for hydrocarbons (Sandvik et al. 1992), and a general oil expulsion threshold of 100 mg HC/g C_{org} has been suggested for kinetic modelling purposes (Pepper & Corvi 1995). However, studies of a compositionally related suite of vitrinite-rich coals from Tara-1 well in the Great South Basin of New Zealand, which span the oil expulsion window, suggest that simple, bulk sample measurements do not give a clear picture of expulsion characteristics. For example, it has been reported that the proposed onset of expulsion is marked by a significant fall in the atomic H/C ratio and increase in NMR aromaticity, consistent with a pulse of expulsion of oil enriched in paraffinic hydrocarbons, perhaps released from over-pressured pores, whereas Rock-Eval bitumen indices (BI = S1/C_{org}) remain fairly constant, more consistent with a gradual release of hydrocarbons once a saturation threshold has been reached (Killops et al. 1998, 2001). The present study seeks to provide improved information on the mechanism of expulsion and the saturation threshold from thermal extraction-gas chromatography of Tara coal samples.

Bulk, open system, kinetic studies of the suite of Tara coals showed a major change in kinetic parameters at the onset of oil expulsion, corresponding to a jump in the thermal stress needed to generate hydrocarbons (Killops et al. 2002). The difference between the pre- and post-expulsion coals suggested structural rearrangements had occurred in the kerogen matrix during maturation (Schenk & Horsfield 1998), and were presumably responsible for the increase in HI up to the onset of expulsion, although the degree to which such changes had been masked by bitumen retained in closed pores prior to the onset of expulsion could not be assessed (Killops et al. 2002). Information about changes in the structure of the petroleum-generating fraction of the kerogen, together with quantification of the paraffinic oil potential, are sought by pyrolysis-gas chromatographic analysis of Tara coal samples.

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