Modeling Expelled Petroleum Fluids from Coals

McCormack, Niall[1], Andy Pepper[1], Mike Adams[2] (1) Amerada Hess Corporation, Houston, TX
(2) Amerada Hess Corporation, London, UK

Expulsion of petroleum from coals has been a controversial subject for a number of years; with protagonists at one end of the spectrum claiming all coals as potential oil expellers while others accept only gas expulsion potential.

We show, using a simple two component scheme, that both arguments are valid to a degree, depending on the depositional environment and organic input that determines kinetics of generation, together with the expulsion efficiency determined largely by the initial HI. It is equally important to model the coal-bearing formation as a population, rather than averaging, as required by many extant modeling approaches.

Linking the kinetic model components with “engineering” type correlations allows us to predict physical properties such as subsurface density, viscosity, and interfacial tension. Unlike aquatic source rocks, relatively few terrestrial coals can expel low GOR (few hundred scf/bbl) oil, with much of the expulsion product corresponding to a higher GOR, volatile product followed by a volumetrically dominant gas charge. Coal-derived petroleum systems are prone to gas-flushing before significant low GOR oil can accumulate. Thus coal-sourced oils (reservoir fluids) are typically characterized by high formation volume factor and low viscosity. To demonstrate these points we will use examples from the Jurassic Khatatba Formation of the Western Desert, Egypt, and various Australasian basins.