

Source rock potential, palaeoenvironment & thermal maturity of the lower Ecca group, South Africa: Implications for hydrocarbon exploration.

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ABSTRACT

The Prince Albert and Collingham formations of the lower Karoo succession contain organic rich shales deposited in the extensive anoxic to dyoxic Gondwana basin during the early to middle Permian. A total of 15 samples were subjected to Rock-eval pyrolysis and X-ray fluorescence spectrometry for the determination of its source rock characteristics, thermal maturity and palaeoenvironments. These were then compared to 6 analyzed samples from the Agbada formation of the Niger Delta. The total organic carbon content of the Karoo shales varied between 0.07-1.30 wt%, with an average of 0.46 wt%. Rock-Eval pyrolytic yields and calculated values of hydrogen and oxygen indexes imply that organic matter type is predominantly inert kerogen (Type IV). The measured T_{max} values as determined by Rock-Eval Pyrolysis range between 215°C-424°C, this corresponds to thermally immaturity. Despite the age of the samples the thermal maturity of these kerogens are generally low, therefore suggesting uplift and exposure of these sediments. This claim is further confirmed by low trace metal concentrations relative to those of the Niger Delta samples. Preliminary studies indicate the Karoo basin holds no significant hydrocarbon generating potential, apart from gas. Further geochemical studies and petroleum systems analysis may however reveal hydrocarbon accumulations within the Karoo basin.

Key words: Kerogen, Karoo basin, Source rock, thermal maturity, palaeoenvironment.