Thermal Regime Relation to Hydrocarbon Generation of the Saharan Basins

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Reconstruction of the thermal histories of a sedimentary basin not only enables a numerical simulation of the temperature history of buried source formations and the change in maturity of its organic matter, but also an assessment of its hydrocarbon potential. The comparison of the computed history of hydrocarbon generation with the times of trap formation and migration pathways helps to assess the basin's hydrocarbon potential. Reconstruction of the thermal evolution in the Saharan Basins provided information on maximum paleotemperatures, timing and mechanism of thermal activation and cooling, paleotemperature gradients as well as on the relative roles of erosion and intrusive-hydrothermal activity. From these data the generation of hydrocarbons in the source rocks could be reconstructed.

The main factors responsible for heating the area, other than burial are an elevated basal heat flow resulting from lithosphere thinning and widespread intrusive-hydrothermal activity. In the Late Triassic-Early Jurassic, as well as in the Cenozoic, the latter factors were responsible for the advanced maturation of the organic matter and the mineral diagenesis in the Paleozoic source shales. Evidence for this maturity comes from *Ro*-values reaching 1.5-2.7 % and coke textures in organic material as well as from occurrence of pyrophyllite, mica, chlorite, and some zeolites such as laumontite in these shales. The apparent depth of burial of these rocks was not sufficient to account for the observed organic and mineral transformations. In particular, most of the observed clay minerals are indicative of an intrusive-hydrothermal environment.

Two principal phases of heating and hydrocarbon generation affected the study area. The first occurred in the Late Carboniferous as a result of heating due to burial and thermal activation following changes in lithospheric thickness in various areas. The second phase was mainly caused by an intense Late Triassic-Early Jurassic activation accompanied by intrusive-hydrothermal heating. The last heating phase involved the generation of dry gas in deeper part of the basins and cracking of previously generated oil and the generation of oil-wet gas in shallower parts, in particular, on the flanks of the basins.