

Petroleum System of Deep-Water Offshore Namibia

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The integration of petroleum system elements and processes, under a 3D petroleum system modeling approach, has allowed the establishment of the presence of an overcharged oil and gas province in deep-water offshore area of the Namibian. Carbon isotope values of Kudu samples compared to Campos basin ones reveal they derived from lacustrine source rocks. High resolution geochemistry, biomarkers and diamonds results from condensates of the Kudu field indicate the hydrocarbons not only derived from highly cracked rift source rocks but also they are mixed with black oils from marine transitional sequences. The reservoir rocks of the offshore Namibia are composed of syn-rift sandstones, shallow marine sandstones and a widespread Upper Cretaceous and Tertiary turbidite systems along the basin. The presence of significant amplitude anomalies in the Aptian succession, in deep water, can bear potential reservoir targets that have not been tested and can have correlations with similar interval in the Santos Basin.

A thick regional seal is widespread along the entire basin in the Aptian, Albion and Upper Cretaceous sequences. In some deep water settings, the distribution of Miocene and younger successions has played an important role in the recent hydrocarbon charge history.

Modeling of the petroleum systems in the study area has indicated the rift source rocks in the main depocenters are fully transformed (~100%) at present day. On the other hand, the marine source rocks are partly transformed and cannot be considered as significant source rock system in the area, unless in local depocenters, where it reached the gas generation stage, as the ones near Kudu Field. Predicted temperature values in the main rift source rock depocenter systems suggest values that are critical in preserving the oil prone nature of the whole area. Modeling of petroleum migration has revealed traps inserted in sizeable drainage areas, with suitable flow patterns towards them. Secondary cracking to gas of lacustrine source rocks and of migrated oil gas predict compositions consistent with the ones of Kudu field. Elements and processes are arranged in appropriate timing that economic accumulations are highly possible in the area. The deep waters of the offshore Namibia is the new hydrocarbon exploration frontier in the south-west coast of Africa and in the next few years huge accumulation will be found.