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Shale gas activities in South Africa: The game changer in energy mix

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South Africa is still new to the concept of shale gas and needs to conduct research that will support petroleum exploration and help develop regulations around production. Several Oil and Gas Exploration companies have applied for Shale Gas Exploration licenses onshore, these have not yet been granted. Shale gas exploration in South Africa could be facing two major unknown geological questions: the amount of economically recoverable gas trapped in the Karoo formations and the geo-environmental problems linked to the nature and the structure of the rock, the ground water migration and the micro-seismicity. The Council for Geo-science Shale gas project commenced in the year 2015. The site selected for the project is in Beaufort West Commonage with a farm name Bulskop 143. The objectives of the project will be to collect and review new geological information on the of the Karoo, to define an environmental baseline, to assess the amount of recoverable gas mainly from the White-hill and Prince Albert Formations, to cover various geo-environmental impacts like ground water dynamics with possible contamination, and monitor potential seismic interferences. On completion, the study will have interrogated the whole value chain of exploring shale gas except for the technology associated with it. The Geology has been reviewed using existing historical geological data and unpublished reports, such as the geological maps, regional cross-section and structural interpretation. The Hydrogeology task has reviewed the groundwater quality data using historical data from Department of Water and Sanitation. In addition, hydro-census (borehole auditing) work has been conducted to confirm the water (both surface and ground water) quality of the area and to generate a water quality database of the area to be drilled. The hydro-census activity was followed by collection of water samples for laboratory analysis to generate a baseline data base.

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Impact of low concentration surfactant on interfacial tension and water/oil relative permeability

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In this paper, experimental study of a surfactant formulation required for reduction of water/oil interfacial tension in three different permeability sandstones and the effect of a sulfate surfactant in imbibition process and oil recovery in core samples. Interaction between the surfactant and rock (adsorption) has also been examined. Measurement of critical micelle concentration, determination of water/oil interfacial tension using pendant drop method, phase behavior test was conducted to characterize surfactant by obtaining solubilization ratio and optimal salinity. Core-flooding experiment was done with and without surfactant to compare the effect of surfactant on water/oil relative permeability. Surfactant adsorption into the different core samples evaluated using UV spectrometry. Sendra software was used to history match differential pressure and oil recovery data to obtain relative permeability curves and end point saturations and to evaluate the effect of surfactants on fluid mobility. The Alcohol alkoxy sulfate surfactant was selected for the experiment as other surfactants did not give the required interfacial tension. From the phase behavior experiment, type III micro-emulsion phase is formed which is not viscous. Solubilisation of 10 was obtained at 4.5% salinity which is close the brine salinity used for injection. Water/oil interfacial tension was reduced from 17dynes/cm to 0.01dynes/cm. Oil recovery from imbibition process when surfactant was introduced increased by 22%. After history matching production and pressure data with Sendra software, relative permeability to oil increased and there was a decrease in residual oil saturation. The connate water saturation was not affected by the use of surfactant. During the experiment it was observed that water breakthrough was delayed when surfactant was introduced into the injection brine during imbibition. Low concentration surfactant introduced into injection water can increase the imbibition rate and oil recovery in both high and low permeability sandstone.

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