

NMR T2 Cut-Off Determination for Shales

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Abstract

Unconventional resources are expected to become increasingly important to meet the world's growing energy demand. Shale reservoirs are of particular interest, but they are also hard to characterise. Nuclear magnetic resonance is a valuable tool that has been used successfully to evaluate petrophysical properties of rocks in conventional reservoirs. The tool's measurements can be interpreted to understand the pore size distribution of the rock and the fluids present, which can ultimately lead to the development of theoretical models to estimate permeability. This study presents the results of low field NMR measurements in fully and partially saturated shale samples. T2 distributions were acquired on samples from the Perth basin initially fully saturated with 30,000 ppm KCl brine, later centrifuged and finally heated. Analysis of the data shows that while a conventional centrifuge does not provide enough capillary pressure to remove the non-capillary bound fluids from shale samples, oven heating can be a feasible method to determine a cut-off between movable and immovable fluids. The average optimum temperature at which the samples have to be heated to evaporate all free water was found to be 62°C and an average T2 cut-off of 0.27 msec was also established. This procedure allows a more accurate understanding of fluid distribution in shales, crucial for a good petrophysical characterization.