[PS]Investigate Hydrocarbon Charge History Using X-ray Micro CT, FM-SEM and Fluid Inclusion Techniques, An Example from the Kela-2 Giant Gas Field, Tarim Basin, China*

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Abstract

A core plug sample from the Kela-2 Giant Gas Field with a proven reserve of 10 TCF in the northern Tarim Basin, western China was characterised in great details using X-ray micro CT, Field Emission SEM (FE-SEM), and fluid inclusion spectroscopic techniques. This enables the detection of hitherto unattainable fine features at nm to micro scales in 3D including the spatial distribution of mineral assemblages, microfractures, hydrocarbon inclusions, bitumen, and nano sized oil films or drops filled in pores and fractures within a largely dolomitised tight reservoir rock.

Cross calibration among the techniques enable the identification of the spatial distribution of the first oil charge principally along the margins of the calcite remnant during the initial domotisation. A second oil charge was recorded by bitumen within fractures filled with calcite veins that cut through the domotised rock, suggesting a relatively rapid and concomitant charge relating to a regional tectonic or structural event. Both oil charges were subsequently flushed by large quantities of gas generation, which was probably migrated through the deep faults and fractures in the thrust and fold belt of the Kuche Foreland Basin after the reservoir cementation. Although the reservoir depth at the time of oil charge was modelled to be around 6000 m deep, there is no evidence indicating that the oil in the reservoir was thermally pyrolysed as movable nano oil films or drops were observed to be pervasive within the reservoir rock. The early oil was likely altered by the subsequent gas flushing at a relatively rapid rate resulting in dissolution of the oil in the

gas completely and leaving the bitumen residues in the isolated pores or fractures. This interpretation is consistent with the residual oil saturation profile in the gas-water transitional zone of the Kela-2 well.

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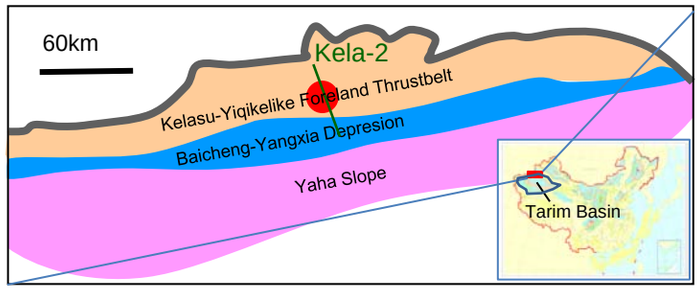
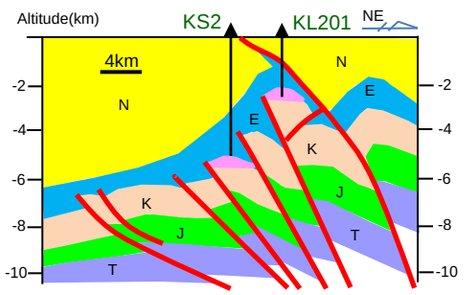
Abstract

A core plug sample from the Kela-2 Giant Gas Field with a proven reserve of 10 TCF in the northern Tarim Basin, western China was characterised in great details using X-ray micro CT, Field Emission SEM (FE-SEM) and fluid inclusion spectroscopic techniques. It is identified that the first oil charged principally along the margins of the calcite remnant during the initial domotisation. A second oil charge was recorded by petroleum inclusion within fractures filled with calcite and quartz veins that cut through the domotised rock, suggesting a relatively rapid and concomitant charge relating to a regional tectonic or structural event. Both oil charges were subsequently flushed by large quantities of gas generation, which was probably migrated through the deep faults and fractures in the thrust and fold belt after the reservoir cementation.

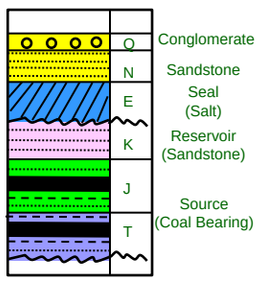
Geological Map



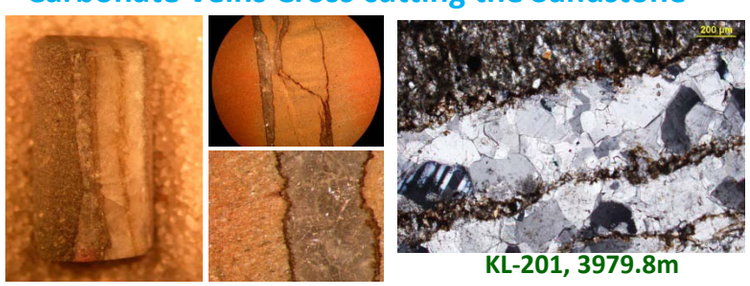
Cross Section of Gas Field



Strata Column

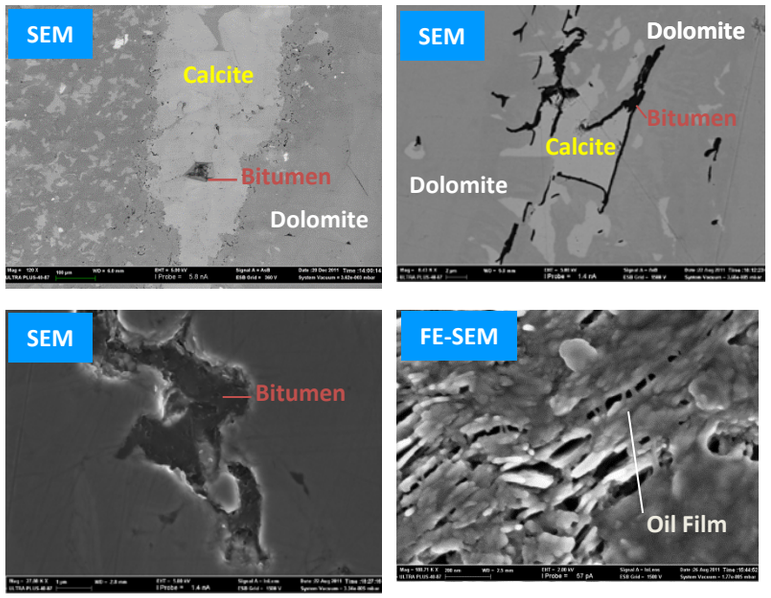


Carbonate Veins Cross cutting the Sandstone

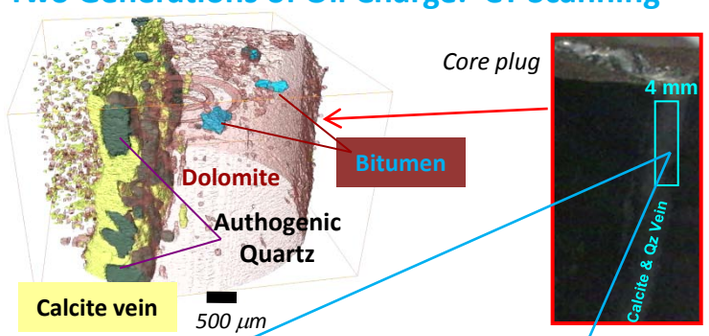


KL-201, 3979.8m

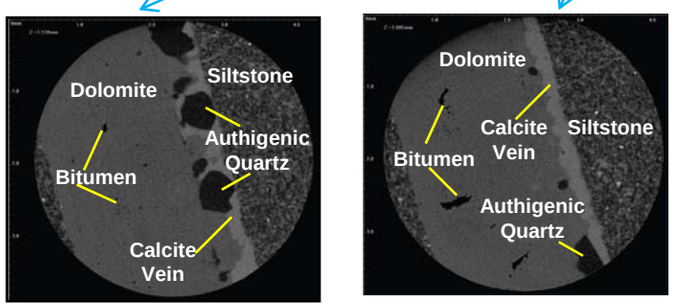
Two Generations of Oil Charge: SEM and FE-SEM



Two Generations of Oil Charge: CT Scanning

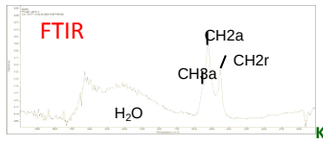


KL201 3979.8 m

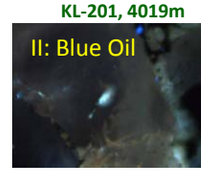


Gas Flushing after Oil Charge: Fluid Inclusions

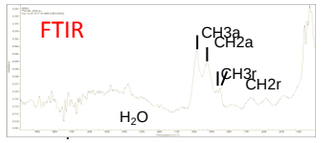
KL-201, 4019m

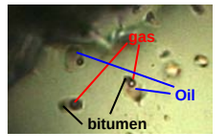


KL-201，3934.8m，gas inclusions in quartz fractures

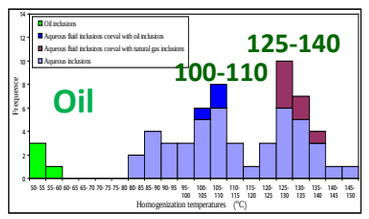


KL-201, 3778

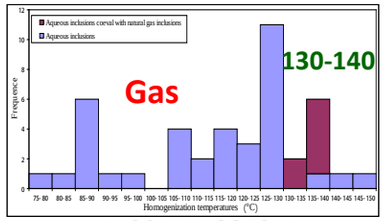




KL-201，3934.8m，three phase inclusions

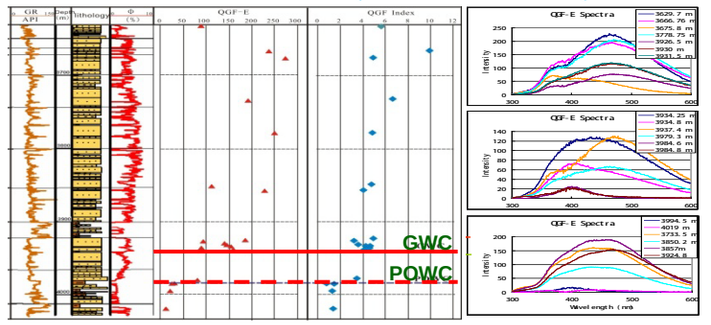


Dabei-1, E, 5572.5m



KL-201, K, 3850.4m

POWC is below GWC: QGF Index and QGF-E



Hydrocarbon Charge History