The diagenetic fingerprint of the Amadeus Basin, NT

Preliminary report

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Introduction

Petroleum potential and rock properties in the Central Australian Basins are poorly understood. The most comprehensive dataset is from the Amadeus Basin, currently the most hydrocarbon prolific Central Australian Basin. Petroleum exploration however, has been sporadic, largely due to the lack of understanding of these basins. Such frontier basins have great potential for conventional hydrocarbon accumulations, unconventional coal seam and shale gas and sediment-hosted mineralisation.

Description of Project

The project will assess the existing data (literature review) of the Amadeus Basin and utilise inexpensive methods (e.g. diagenesis, petrographic studies) that can expand current knowledge. For example, diagenesis plays a crucial role in defining porosity and permeability, giving an understanding of the fluid history of an area. The results of the additional studies will be combined with existing data and interpreted in relation to known petroleum occurrences. Outcomes will be reviewed for their application to adjacent basins.

Objective

This scoping study in the Amadeus Basin will evaluate the potential for (a) predicting reservoir properties in frontier basins and (b) extrapolating knowledge from the better-understood basins into the underexplored basins.

The ultimate goal is to develop a resource to assess and access reservoir potential, e.g. rock properties, traps, mineralisation models and facilitate the evaluation of their economic potential.

In case of a positive outcome, other frontier basins will be evaluated as part of a multidisciplinary project.

The resulting Central Australian Basin database will contain information on burial history, hydrocarbon and mineral potential initially based upon parameters from the Amadeus Basin.

Sample Description

Sample ID: MW1 – Mount Winter1 2191m

Sample type:	blue stained polished section
Lithology:	Evaporite
Porosity:	Poor
Grain size:	Very fine
Detrital mineralogy:	Gypsum matrix, minor quartz
Authigenic mineralogy:	Pyrite, dolomite (dark gr), calcite (gr), gypsum (light gr)

Sample ID: MW6 – Mount Winter 2A 176.2m

Sample type:	blue stained polished section
Lithology:	Sandstone
Porosity:	-
Grain size:	medium
Detrital mineralogy:	Quartz, pyrite, clay and minor K-feldspar
Authigenic mineralogy:	Quartz overgrowth, poor grain-to-grain contact, K-feldspar dissolution, apatite growth and dissolution, associated pyrite, hairy illite in pores

Sample ID: MW2 oil – Mount Winter 2A 178.4-178.6m

Sample type:	blue stained polished section
Lithology:	Sandstone
Porosity:	Poor to moderate
Grain size:	medium
Detrital mineralogy:	Quartz, K-feldspar
Authigenic mineralogy:	K-fsp dissolution skeletal, K-fsp overgrowth, pyrite, quartz overgrowth, calcite cement pore filling – ferroan, Mn and Mg after K-fsp, secondary calcite dissolution

Sample ID: MW2 – Mount Winter 2A 178.4-178.6m

Sample type:	blue stained polished section
Lithology:	Sandstone
Porosity:	Poor to moderate
Grain size:	medium
Detrital mineralogy:	Quartz, K-feldspar
Authigenic mineralogy:	Quartz overgrowth, ferroan calcite in pores (pore occluding) and patchy (some Mg and Mn bearing), K-fsp dissolution (skeletal), K-fsp overgrowth, rare clay minerals (illite replacing K-fsp)

Sample ID: OR4 – Orange 1 871.7m

Sample type:	blue stained polished section
Lithology:	Sandstone
Porosity:	Poor to moderate
Grain size:	coarse
Detrital mineralogy:	Quartz, K-feldspar
Authigenic mineralogy:	Apatite nodules, dolomite, quartz overgrowth, microquartz in pores, clay, styolite in quartz, heavily quartz cemented

Sample ID: OR3 – Orange 1 821m

Sample type:	blue stained polished section
Lithology:	Sandstone
Porosity:	Poor to moderate
Grain size:	coarse
Detrital mineralogy:	Quartz, K-feldspar
Authigenic mineralogy:	Quartz overgrowth, quartz pore filling, clay coating (illite), styolites in quartz

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