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COOPER BASIN

SOURCE ROCK STUDIES

REPORTS AND DATA

Submitted by

Delhi Petroleum Pty Ltd, Santos Ltd, the University of Adelaide, CSIRO, Amdel Ltd and
Shell Development (Australia) Pty Ltd
1995

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CONTENTS OF VOLUME TWO

REPORTS:	Shibaoka, M., 1972. Hydrocarbons in coals from Moorari and Tirrawarra, Cooper Basin, South Australia (CSIRO, Division of Mineralogy, Minerals Research Laboratories, Restricted Investigation Report no. 460 R for Delhi International Oil Corp., 14/2/72).	8426 R 6 [6 pages]
	Gould, K.W. and Shibaoka, M., 1972. Gas chromatographic analysis of Tirrawarra oil and chemical analysis of Tirrawarra and Moorari coals (CSIRO, Division of Mineralogy, Minerals Research Laboratories, Restricted Investigation Report no. 507 R for Delhi International Oil Corp., October 1972).	8426 R 7 [8 pages]
	Bennett, A.J.R. and Shibaoka, M., 1973. Reflectance of coals from Gidgealpa 3 and Tinga Tingana 1 wells, Cooper Basin, South Australia (CSIRO, Division of Mineralogy, Minerals Research Laboratories, Restricted Investigation Report no. 577 R for Delhi International Oil Corp., December 1973).	8426 R 8 [5 pages]
	Smyth, M., 1974. Petrographic composition of coals from Gidgealpa 3, Innamincka 1 and Tinga Tingana 1 wells, Cooper Basin, South Australia (CSIRO, Division of Mineralogy, Minerals Research Laboratories, Restricted Investigation Report no. 620 R for Delhi International Oil Corp., May 1974).	8426 R 9 [8 pages]
	Rigby, D. and Smith, J.W., 1980. Carbon dioxide in natural gas from the Cooper Basin (CSIRO, Institute of Earth Resources, Fuel Geoscience Unit, Restricted Investigation Report no. 1131 R for Delhi Petroleum Pty Ltd, May 1980).	8426 R 10 [10 pages]
	Philp, R.P. and Gilbert, T., 1983. Geochemical prospecting for natural gas in the Cooper Basin, South Australia, 1980 (CSIRO, Institute of Energy and Earth Resources, Div. of Fossil Fuels, Restricted Investigation Report no. 1377 R for SADME, January 1983).	8426 R 11 [20 pages]
	Geotechnical Services Pty Ltd, 1995. Rock-Eval pyrolysis source rock geochemical data for selected Cooper Basin drill core samples from wells Beanbush 1, Tilparee-A 1, Marana 1, Wanara 1, Mudlalee 1, Daralingie 1, Gidgealpa 5, Meranji 7, Coopers Creek 1, Fly Lake 1, Moorari 2, Munkarie 2, Toolachee 1, Munkarie 4, Toolachee 23, Moorari 1, Mudrangie 1, Coonatie 1, Yapeni 1, Pando North 1, Pando 2, Lake Hope 1, Pando 1, Wancoocha 1, Gidgealpa 9, Tirrawarra 4, Sturt 8, Thurakinna 2, Daralingie 2, Narcoonowie 1, Pelketa 1, Murteree 1, Pinna 1, Jack Lake 1, Pelican 3, Merrimelia 4, Merrimelia 3, Merrimelia 1, Meranji 4, Gidgealpa 5, Leleptian 2, Jack Lake 2, Kanowana 1, Gidgealpa 6, Fly Lake 2, Fly Lake 3, Moorari 5, Moorari 3, Moorari 7, Kujani 2 and Moorari 9 (contractor's report for Santos Ltd, September - November 1995).	8426 R 12 [22 pages]

END OF CONTENTS

RESTRICTED
CIRCULATION

RESTRICTED INVESTIGATION REPORT 620R

CSIRO

MINERALS RESEARCH LABORATORIES

DIVISION OF MINERALOGY

PETROGRAPHIC COMPOSITION OF COALS FROM GIDEALPA NO.3,
INNAMINCKA NO.1 AND TINGA TINGANA NO.1 WELLS,
COOPER BASIN, SOUTH AUSTRALIA

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MAY 1974

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CSIRO

MINERALS RESEARCH LABORATORIES

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TO: Delhi International Oil Corporation

Errors in IR 620R - depths in Table 1 should be:

Gidgealpa No. 3

622 - 631	}	U. Cret.
686 - 695		
869 - 878		
2054 - 2070		
2179 - 2195	}	Permian
2234 - 2249		
2280 - 2292		

Tinga Tingana No. 1

247 - 265	}	U. Cret.
509 - 527		
1420 - 1426	}	Permian
1480		
1500 - 1515		
1634 - 1649		
1750 - 1759		

Innaminka No. 1

85 - 91	}	U. Cret.
137 - 152		
290 - 311		
521 - 530		
899 - 914		
2097 - 2100	}	Permian
2176 - 2188		
2256 - 2271		

... probably from about 1530m

M. Smyth

INTRODUCTION

Many ditch cutting samples from Gidgealpa No.3, Innamincka No.1 and Tinga Tingana No.1 wells, covering a wide geological succession (Permian to Cretaceous) were supplied to CSIRO by Delhi International Oil Corporation.

The samples were originally requested for reflectance measurements, the results of which have been reported to the company in IR 524R and IR 577R. These samples have also been used to make the petrographic analyses which form the subject of the present report.

It is not certain whether coal samples obtained from ditch cuttings by gravity separation represent the average composition of the original coal seams. However, all samples were treated similarly and processed by the same preparation technique. Results are therefore expected to give some information about the stratigraphical variation of the petrographic composition of the coal seams. The fact that all these wells show a very similar tendency supports this assumption.

In order to investigate the potential of rocks as hydrocarbon sources, not only the coals, but also the organic material dispersed in interseam sediments should be studied. (This work is in progress).

In this preliminary report, only the results of petrographic analysis of the coals, completed to date, are given. These results could give information about the sedimentary history of this basin.

SAMPLE PREPARATION

See Restricted Investigation Report 577R

RESULTS

To date analyses have been carried out on coals from the Cretaceous to the Permian in three wells: Gidgealpa No.3, Innamincka No.1 and Tinga Tingana No.1. Results of the petrographic analyses are shown in Table 1 and in Fig. 1.

There are distinct differences in the vitrinite content between the Cretaceous coals and the Permo-Triassic coals. Furthermore among the Cretaceous coals a clear upwards increase in vitrinite occurs in all three cases.

The Permian coals show fluctuations in their vitrinite contents. The lower two coals from Innamincka No.1 (2343-2356 m and 2428-2444 m) are supposed to be of Devonian age according to the well log. However, reflectance measurements of the sample from 2428-2444 m indicate that it is a caving. Both of these "Devonian" coals are probably cavings.

DISCUSSION

The vitrinite content of a coal could be regarded as giving an indication of the type of sedimentary environment in which the coal accumulated. Vitrinite-rich coals are thought to have accumulated in rapidly subsiding, unstable conditions, whilst vitrinite-poor coals have accumulated in more slowly subsiding, stable environments. Where coal measures are thick

the coal seams tend to be rich in vitrinite, where coal measures are thin the coal seams tend to be poor in vitrinite. Thus the petrographic composition of coal seams appears to reflect the rate of deposition (or subsidence) as a whole. (Shibaoka and Smyth, 1973).

From Fig. 1 it appears that the Cooper Basin in Permian times was fluctuating between slowly and more rapidly subsiding conditions. From the Triassic or Jurassic onwards, the rate of subsidence of the basin might have increased steadily, as shown by the progressive increase in the quantity of vitrinite in the coals, although there are wide gaps between sampled points in the profile from the Jurassic to the Lower Cretaceous. The changes in coal composition suggest that at any given time until the end of the Upper Cretaceous, the rate of subsidence was similar in Innamincka No.1 and Tinga Tingana No.1 and slower in Gidgealpa No.3, but that the acceleration of the subsidence rate during the Cretaceous was greater in Gidgealpa No.3

CONCLUSIONS

Coals from the Permian in the three wells have variable petrographic compositions, but tend to be vitrinite-poor, whilst coals from the Cretaceous are vitrinite-rich. There is a continuous upward increase in vitrinite content, shown very clearly in the Upper Cretaceous coals.

9. If vitrinite content may be taken as an indication of the rate of subsidence, the Cooper Basin subsided more and more rapidly from the Permian to the end of the Cretaceous.

REFERENCES

Shibaoka, M. and Smyth, Michelle. 1973. "Coal petrology and formation of coal seams in some Australian sedimentary basins". 45th ANZAAS Congress, Perth. Abstracts Section 3, pp 140-142.

TABLE 1

Maceral analyses of coals from the Cooper Basin (mineral matter free)

AGE	DEPTH, m	VITRINITE	EXINITE	MICRINITE	SEMIFUSINITE	FUSINITE	Inertinite
<u>GIDGEALPA NO. 3</u>							
Upper Cretaceous	669-679 ⁽¹⁰⁾	90	2	1	7	-	5
	738-748 ⁽¹⁰⁾	83	7	4	5	1	10
	935-945 ⁽¹⁰⁾	70	4	6	19	1	26
Middle-Lower Jurassic	2211-2228 ⁽⁷⁾	27	20	21	31	1	53
Permian	2346-2362 ⁽¹⁶⁾	17	9	48	24	2	74
	2405-2421 ⁽¹⁶⁾	60	11	13	14	2	29
	2454-2467 ⁽¹²⁾	30	9	34	27	tr	61
<u>INNAMINCKA NO.1</u>							
Upper Cretaceous	92-98 ⁽⁶⁾	98	-	-	2	tr	2
	148-164 ⁽¹⁶⁾	95	2	tr	3	tr	3
	312-335 ⁽²²⁾	88	9	1	2	-	3
Lower Cretaceous	561-571 ⁽¹⁰⁾	83	3	5	8	1	14
	968-984 ⁽⁶⁾	77	2	2	18	1	21
Permian	2257-2261 ⁽⁴⁾	55	5	15	22	3	40
Devonian	2343-2356 ⁽¹³⁾	44	11	28	15	2	45
	2428-2444*	69	21	4	2	4	10
<u>TINGA TINGANA NO.1</u>							
Upper Cretaceous	266-285 ⁽¹⁾	95	1	-	4	tr	4
	548-568	85	5	5	5	tr	10
Permian	1529-1535	63	13	13	10	1	24
	1594 ⁽¹⁾	75	9	8	4	4	16
	1614-1631	50	3	17	26	4	47
	1759-1775	28	6	24	39	3	66
	1883-1893	61	5	15	17	2	34

* from reflectance measurements this appears to be a caving, probably from about 1650 m.

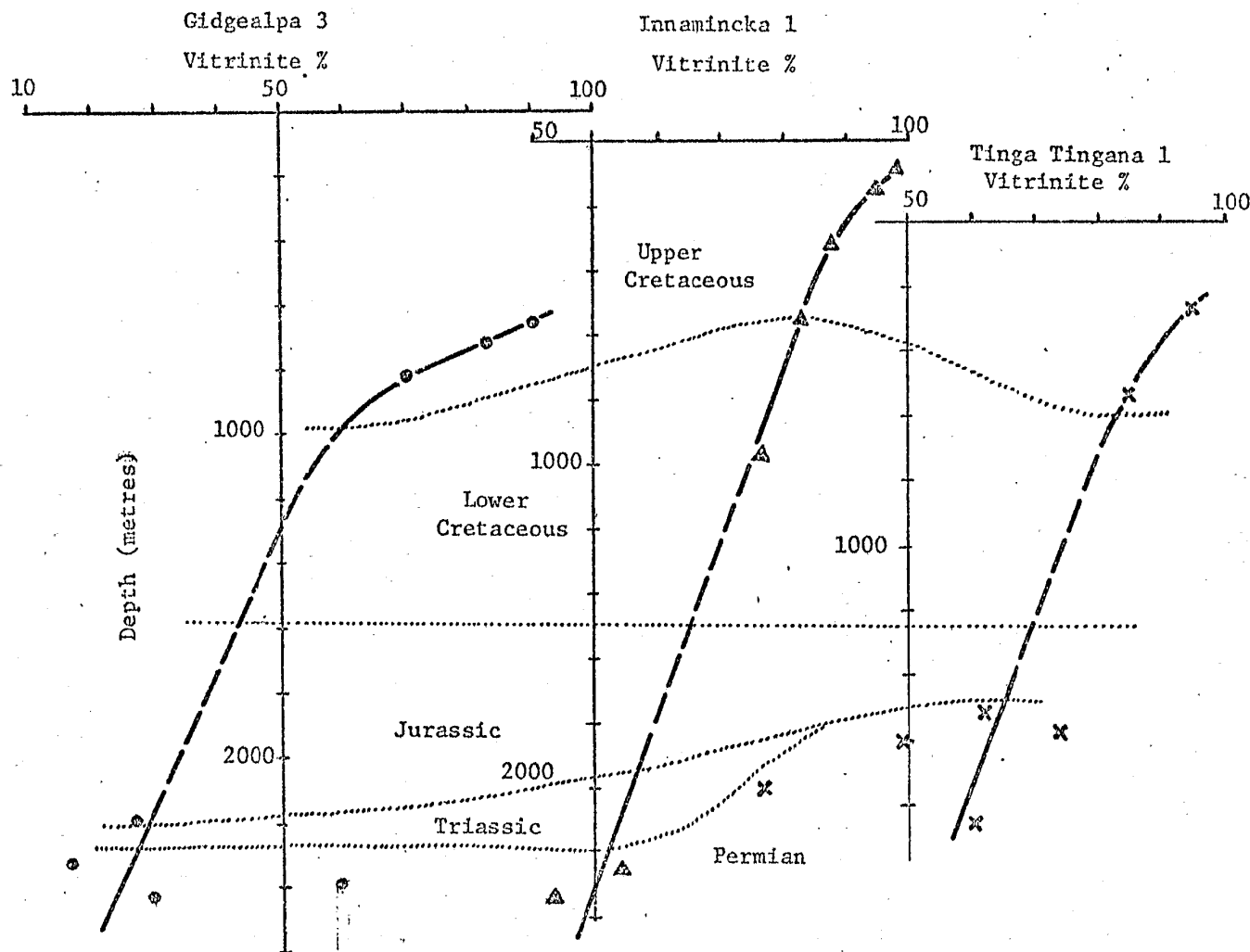


Fig. 1. Stratigraphical variation of vitrinite content in some Cooper Basin coals.