

COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

Record No. 1970 / 7



Dawsonite in Sydney Basin Wells

by

Evelyn Nicholas and S. Ozimic

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Fig. 1 and 1a: Distribution of Dawsonite
in wells in the Sydney Basin

ABSTRACT

Officers of the Petroleum Exploration Branch of the Bureau of Mineral Resources, Geology and Geophysics have recently detected the mineral Dawsonite in eight wells drilled in the central and northern parts of the Sydney Basin. Most of the occurrences are in units of the Permian "Upper Marine Series" but some are in units of each of the "Lower Marine Series", "Lower Coal Measures", and "Upper Coal Measures", all of Permian age, and there is one subsurface occurrence in Triassic sediments. The mineral occurs in both marine and fresh-water sequences.

INTRODUCTION

Dawsonite (basic carbonate of aluminium and sodium) has a long-ranging stratigraphic distribution in the northern and central part of the Sydney Basin, but it has not been identified in wells south of Kirkham No. 1 (Fig. 1a).

The mineral occurs in both marine and coal-measures sequences as a constituent of the matrix of rudites and arenites and in association with carbonate cements, commonly siderite.

SUMMARY OF THE LITERATURE

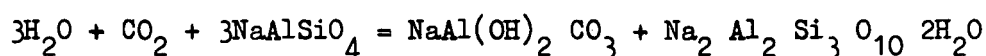
Dawsonite was first analysed and named by Harrington (1874) from a locality near McGill University, Montreal. This deposit was also studied by Graham (1908). It was later described from Tuscany (Chaper 1881, and Friedel 1881), Algeria (Curie and Flamand 1892), Albania (Pelloux 1932), Colorado (Milton and Eugster 1959, Smith and Milton 1966, Smith and Young 1969), Tanganyika (Hay 1963), and St. Bruno Quebec (Mandarino and Harris 1965). In the Sydney Basin, it has been described from the Greta Coal Measures at Muswellbrook (Loughnan and See, 1967), and the Berry Formation of the Upper Grose Valley (Loughnan, 1967b).

Dana's System of Mineralogy (1958) gives a general account of the mineralogy.

FORMATION AND GEOCHEMISTRY

In most of the known localities the formation of dawsonite has been related to hydrothermal activity i.e. a low temperature hydrothermal mineral (Palache, Berman and Frondel 1951). However, in the Green River Formation (Colorado), Olduvai Gorge (Tanganyika), and Sydney Basin occurrences, its formation would seem to be the result of diagenetic processes.

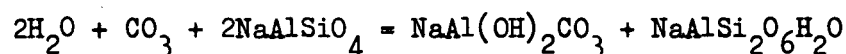
Hay (1963) suggests the following as a possible chemical reaction for the formation of dawsonite at Olduvai Gorge.



nepheline dawsonite natrolite

with volcanic glass and nepheline reacting with solutions of sodium carbonate and bicarbonate.

A similar reaction:



nepheline dawsonite analcite

is proposed for the formation of dawsonite in the Green River Formation (Smith and Milton 1966).

Loughnan (1966 and 1967a) has reported analcite in eleven bores from the Newcastle Coal Measures of the Sydney Basin. He found it to occur at a number of horizons, and considered that the mineral originated in small disconnected lakes or lagoons in an environment of high sodium concentration and aridity. He considers the presence of dawsonite in the Sydney Basin "tends to support the concept that periods of aridity and high soda concentrations accompanied the laying down of the Permian of the Sydney Basin" (Loughnan 1967b).

The distribution of dawsonite in the Sydney Basin obtained from the results of well studies is given in Fig. 1a. Its stratigraphic distribution is indicated in Fig. 1.

Three points emerge from a consideration of this information.

1. The widest geographical distribution is in the "Upper Marine" sequence.
2. The longest stratigraphical range is in the northern and western sectors of the basin.
3. It has not been reported from the southern part of the basin.

ECONOMIC SIGNIFICANCE

Smith and Young (1969) present an analytical method to determine dawsonite, nahcolite, and non-dawsonite alumina extractable from Green River Formation oil shales. They state that "occurring together in oil-yielding rock, dawsonite, nahcolite and gibbsite (?) offer possible production of three products from the same rock - shale oil, alumina, and sodium carbonates".

Dawsonite was recorded in the Greta Coal Measures in Loder No. 1 and Martindale No. 1A wells, and in the Upper Coal Measures in Martindale No. 1A and Kurrajong Heights No. 1 wells, the last two being the most westerly wells studied. If dawsonite occurs in the oil-shale sequences of the coal measures, it may be of some economic significance.

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Distribution of DAWSONITE in wells in the SYDNEY BASIN

	W			E		S		
GROUP	Martindale	Loder	Belford	EMaitland	Kulnura	Kurrajong Heights	Dural South	Kirkham
Narrabeen						CALEY		
Upper Coal Measures	TOMAGO					ILLAWARRA		
Upper Marine	MULBRING BRANXTON	BRANXTON	BRANXTON	MUREE BRANXTON	BRANXTON NOWRA	BERRY NOWRA	BRANXTON	KEDUMBA CREEK (minor)
Lower Coal Measures	GRETA	GRETA						
Lower Marine		Top FARLEY						CONJOLA (restricted interval)

DAWSONITE
PRESENT

DAWSONITE
ABSENT

HORIZON ABSENT

Fig 1

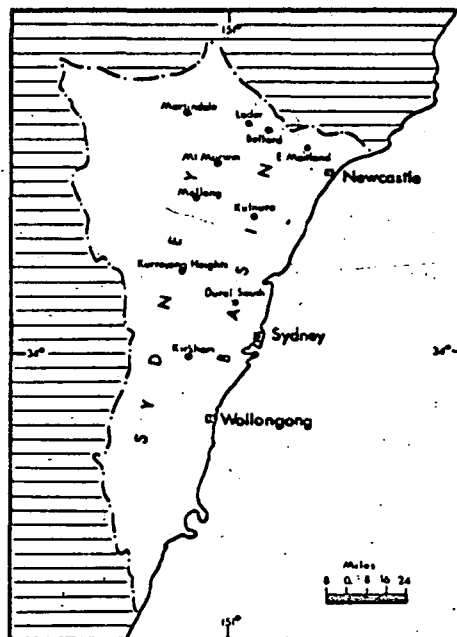


Fig. 1a