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REPORT ON

Pb ISOTOPIC ANALYSES ON EIGHT SAMPLES SUBMITTED BY
AGIP NUCLEARE AUSTRALIA PTY. LTD. ON 22 DECEMBER 1980

by

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Summary

The results of lead isotopic analyses on 8 arkose samples 0365-0372 are given in Table 1 accompanying this report.

Small but significant radiogenic lead anomalies were observed in analyses on samples 0368 ($\delta_{6/4} = 30$) and 0372 ($\delta_{6/4} = 25$).

Sample 0368 contains the most radiogenic lead of any sample analysed so far from this area.

Pb isotopic compositions of samples designated as slightly anomalous may in fact indicate the natural variation of background lead. The significance of these anomalies will be better understood when they are related to distance from the ore-body.

The low $^{208}\text{Pb}/^{204}\text{Pb}$ ratios (Fig. 1) indicate that thorium has not been concentrated in the arkoses.

The Samples

Eight pieces of arkosic drill core were supplied for analysis. Approximately 100 grams of each sample was crushed to powder using a swing mill.

Chemistry and Mass Spectrometry

Aliquots of sample powders were leached in warm HCl and lead was separated from the leach solutions using anion exchange techniques. The pure lead samples were loaded with phosphoric acid and silica gel on single rhenium filaments for mass spectrometry.

The precision of mass spectrometric isotope ratio measurements was within $\pm 0.3\%$.

For the purpose of calculating δ values $^{206}\text{Pb}/^{204}\text{Pb}$ (background) was assumed, from estimates of the isotopic composition of modern lead, to be 18.8. Background $^{207}\text{Pb}/^{206}\text{Pb}$ was taken to be 15.8 and $^{208}\text{Pb}/^{204}\text{Pb}$ as 39.0.

The lead anomaly is expressed in Table 1 as:

$$\delta_{6/4} = \frac{^{206}\text{Pb}/^{204}\text{Pb}_{\text{sample}} - ^{206}\text{Pb}/^{204}\text{Pb}_{\text{background}}}{^{206}\text{Pb}/^{204}\text{Pb}_{\text{background}}} \times 100$$

Analytical Results

Results of lead isotopic analyses are reported in Table 1 and plotted on Fig. 1. The range of compositions of lead isotopes is $^{206}\text{Pb}/^{204}\text{Pb} = 20.27$ to 24.48; $^{207}\text{Pb}/^{204}\text{Pb} = 15.7$ to 16.3; and $^{208}\text{Pb}/^{204}\text{Pb} = 40.60$ to 42.63.

Interpretation

Following the classification of Pb isotopic anomalies given on page 3 of the report submitted to Agip on 3rd September 1980, the isotopic anomalies observed in present samples are as follows:-

No significant isotopic anomaly

$$(\delta_{6/4} < 9)$$

<u>Sample</u>	<u>δ</u>
0365	8

C grade anomaly (barely significant)(δ_{6/4} 10-20)

<u>Sample</u>	<u>δ</u>
0370	11
0369	12
0367	13
0366	16
0371	20

B grade anomaly(δ_{6/4} 21-30)

<u>Sample</u>	<u>δ</u>
0372	25
0368	30

The combined results of lead isotopic measurements in core samples from the area presently under investigation are given on Fig. 1. Samples from Table 1 of this report are shown by closed circles. Earlier analyses are indicated by open circles.

The spread in isotopic composition of the present samples can be seen to be similar to the spread of the isotopic composition of earlier reported samples.

A portion of this spread could reflect the variation in the U/Pb ratio of the country rock. It is not possible to comment further on this without knowing the uranium and lead concentrations of the arkose samples.

The small increase in radiogenic lead observed in Fig. 1 could also indicate movement of radiogenic lead from the ore zone. The relationship between δ values and distance from the ore body will need to be examined to assess the significance of this interpretation.

Pb isotopic analyses have now been made on 17 samples of fresh drill core from this area. The samples show only small radiogenic lead anomalies and it appears that only a narrow aureole of anomalous lead surrounds the present ore zone. This limited dispersion of radiogenic lead could be due

to a number of factors. Transport of radiogenic lead away from the ore zone in groundwater may not have occurred. Or, if it has, dilution by leachable common lead present in the arkose may have significantly diminished the isotopic anomaly.

The value of undertaking further work will depend on the assessment of the distribution of the lead isotopic anomalies relative to the ore zone.

TABLE 1. LEAD ISOTOPIC ANALYSES

Sample	$^{208}\text{Pb}/^{206}\text{Pb}$	$^{207}\text{Pb}/^{206}\text{Pb}$	$^{206}\text{Pb}/^{204}\text{Pb}$	$^{207}\text{Pb}/^{204}\text{Pb}$	$^{208}\text{Pb}/^{204}\text{Pb}$	$\delta_{6/4}\%$
0365	2.003	0.7808	20.27	15.82	40.60	8
0366	1.892	0.7240	21.89	15.85	41.41	16
0367	1.948	0.7511	21.23	15.89	41.28	13
0368	1.718	0.6609	24.48	16.17	42.06	30
0369	1.936	0.7557	20.99	15.86	40.64	12
0370	1.974	0.7529	20.85	15.70	41.16	11
0371	1.894	0.7184	22.51	16.17	42.63	20
0372	1.799	0.6929	23.53	16.30	42.33	25

FIGURE 1

42

$^{208}\text{Pb}/^{204}\text{Pb}$

40

38

$^{207}\text{Pb}/^{204}\text{Pb}$

16

15

$^{206}\text{Pb}/^{204}\text{Pb}$

19

20

21

22

23

24

sample points

1	7532
2	7533
3	7534
4	7535
5	7536
6	7537
7	9156
8	9159
9	9160
10	0365
11	0366
12	0367
13	0368
14	0369
15	0370
16	0371
17	0372

open circles
closed circles