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Radioactivity around Ore-Deposits

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Abstract

Distribution of radioactivity around ore-deposits has been investigated by means of a radioscope with a Lauritsen element. In the present study, six mines have been put into examination. Concentration of radioactive material in the vicinity of deposits of these mines has been observed with interesting results.

Introduction

In most ore-deposits, it may be conjectured that mineralization may have some influences on the distribution of radioactive elements. If so, the said distribution may be useful for getting some knowledges of the mineralization and ore-deposits. In this viewpoint, distribution of radioactive elements around ore-deposits was formerly investigated by Z. HATUDA on the samples from Hirase Mine in Gifu Pref.

In the present investigation, Ôike Mine, Nakatatsu Mine, Kamisugai Mine, Tsuchikura Mine, Karamatsu Ore-Deposits and Ôhara Mine all in Japan were treated. A series of samples were collected from each mines, except samples from Nakatatsu Mine, Karamatsu Ore-Deposite and Tsuchikura Mine which were kindly offered by A. YOSHIKAWA, Y. KANG and K. TAUCHI respectively. Radioactivity of these samples were measured by the same method as that adopted for study of variation in radioactivity across igneous contacts.[1)]

Results of Determinations

Table I. Radioactivity Distribution in Ôike Mine.

Rocks and Ore	Radioactivity	No. of specimens
Hornfels remote from Mine	0.03 div/min	6
Waste part	0.07	1
Highly impregnated part	0.14	1
Ore (mainly pyrrhotite)	0.02	1
Ore (mainly chalcopyrite)	0.05	18

Table II. Radioactivity Distribution in Nakatatsu Mine.

Rocks and Ore	Radioactivity	No. of specimens
Waste part	0.09 div/min	46
Highly impregnated part	0.12	12
Ore (mainly sphalerite)	0.03	10

Table III. Radioactivity Distribution in Karamatsu Ore-Deposits.

Rocks and Ore	Radioactivity	No. of specimens
Ore (hematite)	0.062 div/min	2
Impregnated part	0.261	2
Country rocks	0.165	2

Table IV. Radioactivity Distribution in Ôhara Mine.

Rocks and Ore	Radioactivity	No. of specimens
Ore (mainly chalcopyrite)	0.04 div/min	4
Impregnated part	0.15	3
Country rocks near	0.14	3
Country rocks far	0.08	2

Table V. Radioactivity Distribution in Kamisugai Mine.

Rocks and Ore	Radioactivity	No. of specimens
Ore (mainly chalcopyrite)	0.074 div/min	9
Impregnated part	0.142	12
Country rocks near	0.103	7
Country rocks far	0.056	10
Quartz vein near	0.199	2
Quartz vein far	0.056	1
Ore (mainly rhodochrosite)	0.047	3
Country rocks near	0.116	8
Country rocks far	0.063	10
Quartz vein near	0.175	1
Quartz vein far	0.050	1

Table VI. Radioactivity Distribution in Tsuchikura Mine.

1) One of ore-bodies

1a) Assay Value-Radioactivity Relation.

Assay Value of Cu in %	Radioactivity	No. of specimens
-0.5	0.095 div/min	5
0.5-1.0	0.067	10
1.0-1.5	0.056	10
1.5-2.0	0.056	6
2.0-2.5	0.079	3
2.5-	0.055	5

1b) Situation-Radioactivity Relation.

Zone of Ore-body	Radioactivity	No. of specimens
Outer zone	0.095 div/min	17
Intermediate zone	0.057	16
Inner zone	0.037	6

2) All ore-bodies

2a) Assay Value-Radioactivity Relation.

Assay Value of Cu*	Radioactivity	No. of specimens
Ore	0.072 div/min	8
Impregnated part 1	0.078	8
Impregnated part 2	0.078	7
Impregnated part 3	0.090	10
Impregnated part 4	0.051	12
Impregnated part 5	0.058	8
Country rocks near	0.123	2
Country rocks far	0.002	2

* Assay Value of Cu: Ore > Impregnated part 1 > Impregnated part 2 > ··· > Impregnated part 5.

2b) Situation-Radioactivity Relation.

Zone	Radioactivity	No. of specimens
Outer zone	0.074 div/min	44
Inner zone	0.060	10

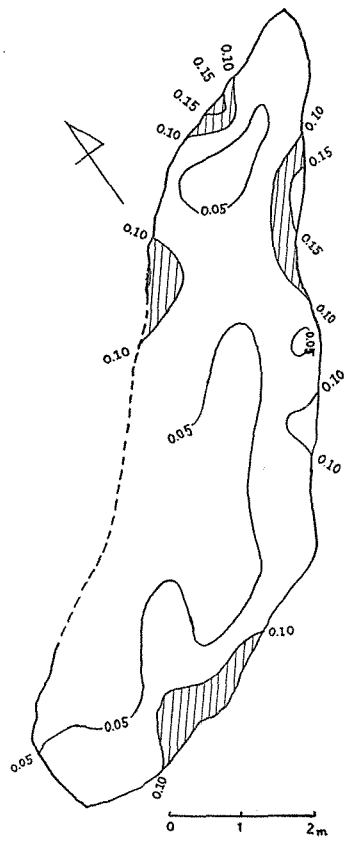

Fig. 1 Distribution of radioactivity expressed in div/min of one of ore-bodies in Tsuchikura Mine, from which radioactivity values in Table VI are calculated.

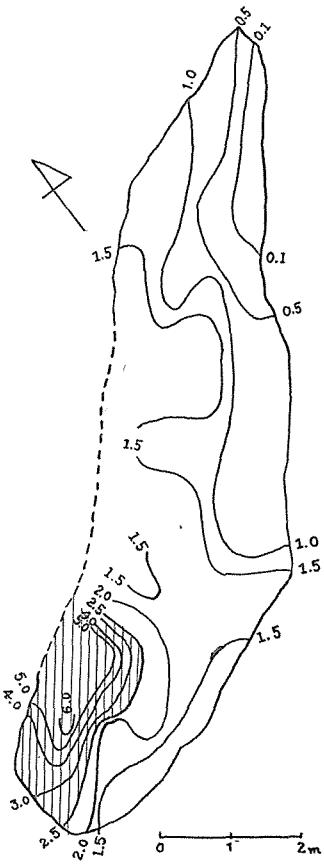

Fig. 2 Distribution of assay value of Cu in % of one of ore-bodies in Tsuchikura Mine, from which assay values in Table VI are calculated.

Conclusion

From the above results, following conclusions may be deduced; (1) Near the ore-deposits in country rocks, especially in impregnated parts, radioactivity is generally higher than those in distant part of the country rocks and in the ore-body. (2) In ore-bodies radioactivity is generally low. (3) The distribution of radioactivity in ore-body seems to have some relations with the situation in the ore-body, but to be independent of the assay values of the ore.

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Reference

1) HATUDA, Z. and S. NISHIMURA; Variation in Radioactivity across Igneous Contacts: Mem. Coll. Sci. Kyoto Univ., Ser. B, 23, pp. 286-289 (1956).