(5) X-rays Diffraction

(i) Specimen :

Specimens were made of Pugu kaolin, Tona clay and Usangi clay average samples in such a manner that the raw materials were dried and fully passed 200-mesh screen by grinding mill. And then, powder X-ray diffraction were conducted on these specimens.

(ii) Measurement :

Measurements were made under the following conditions.

Target	:	Cu
Filter	:	Ni
Voltage	:	20KVP
Current	:	10mA
Time constant	:	2 sec.
Scanning speed	:	2°/min.
Chart speed	:	2 cm/min.
Divergency	:	1°
Receiving slit	:	0.15 mm

(iii) Result :

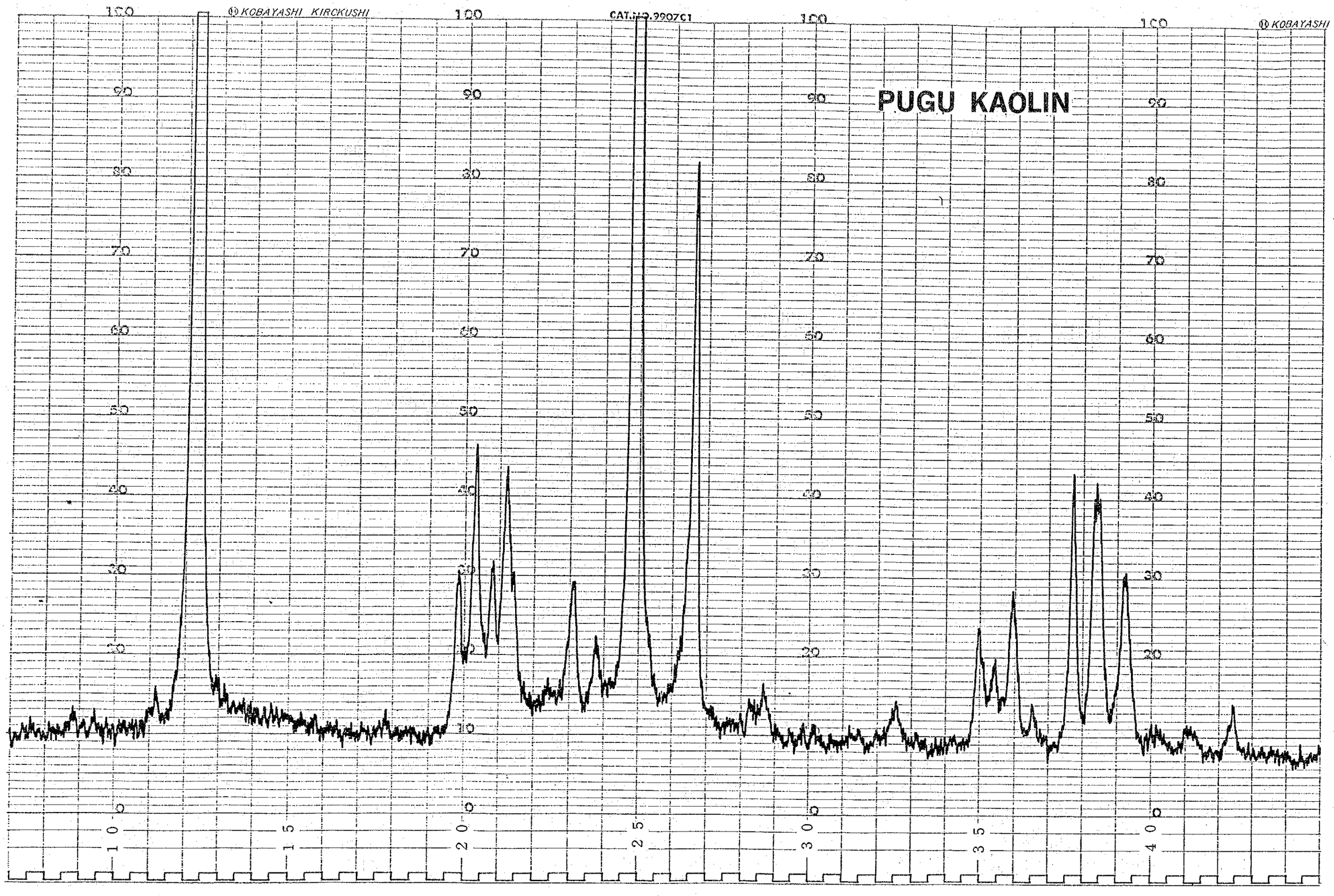
Results of the measurements are as shown in the X-ray chart and Table 7.

Pugu kaolin is composed of kaolinite and quartz, Tona clay of quartz, kaolinit and gypsite, and Usangi clay of quartz, kaolinite and gypsite.

Table 7 Result of X-ray diffraction

	PUGU KAOLIN	TONA CLAY	USANGI CLAY
KAOLINITE	+++++	++	++
QUARTZ	++++	+++++	+++++
GIBBSITE		++	+

+++++	:	Very Strong
++++	:	Strong
+++	:	Middle
++	:	Weak
+	:	Very Weak


KOBAYASHI KIRCKUSHI
CAT.NO.990701
KOBAYASHI
PUGU KAOLIN
100
90
80
70
60
50
40
30
20
10
0
10
15
20
25
30
35
40

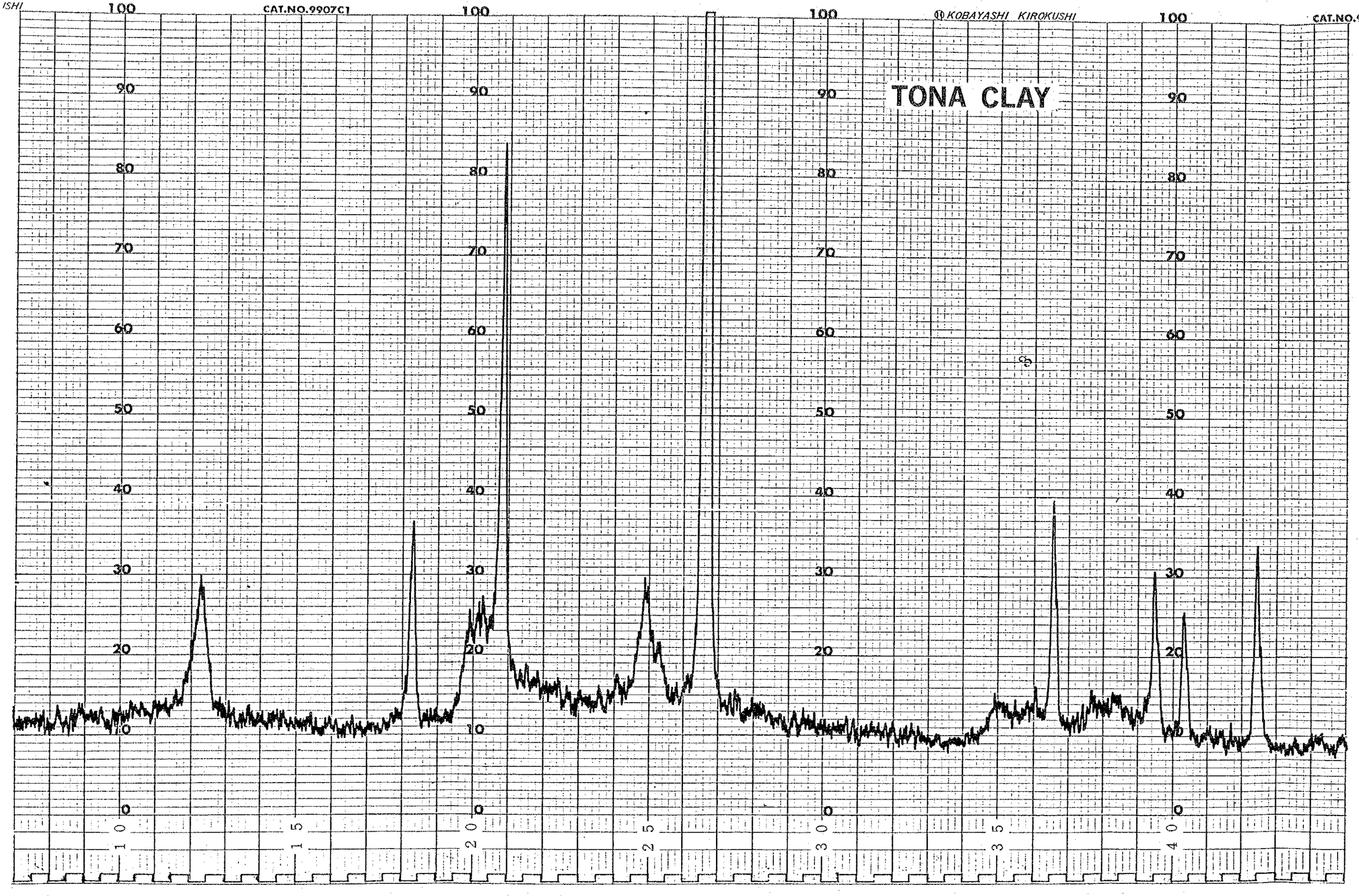
ISHI

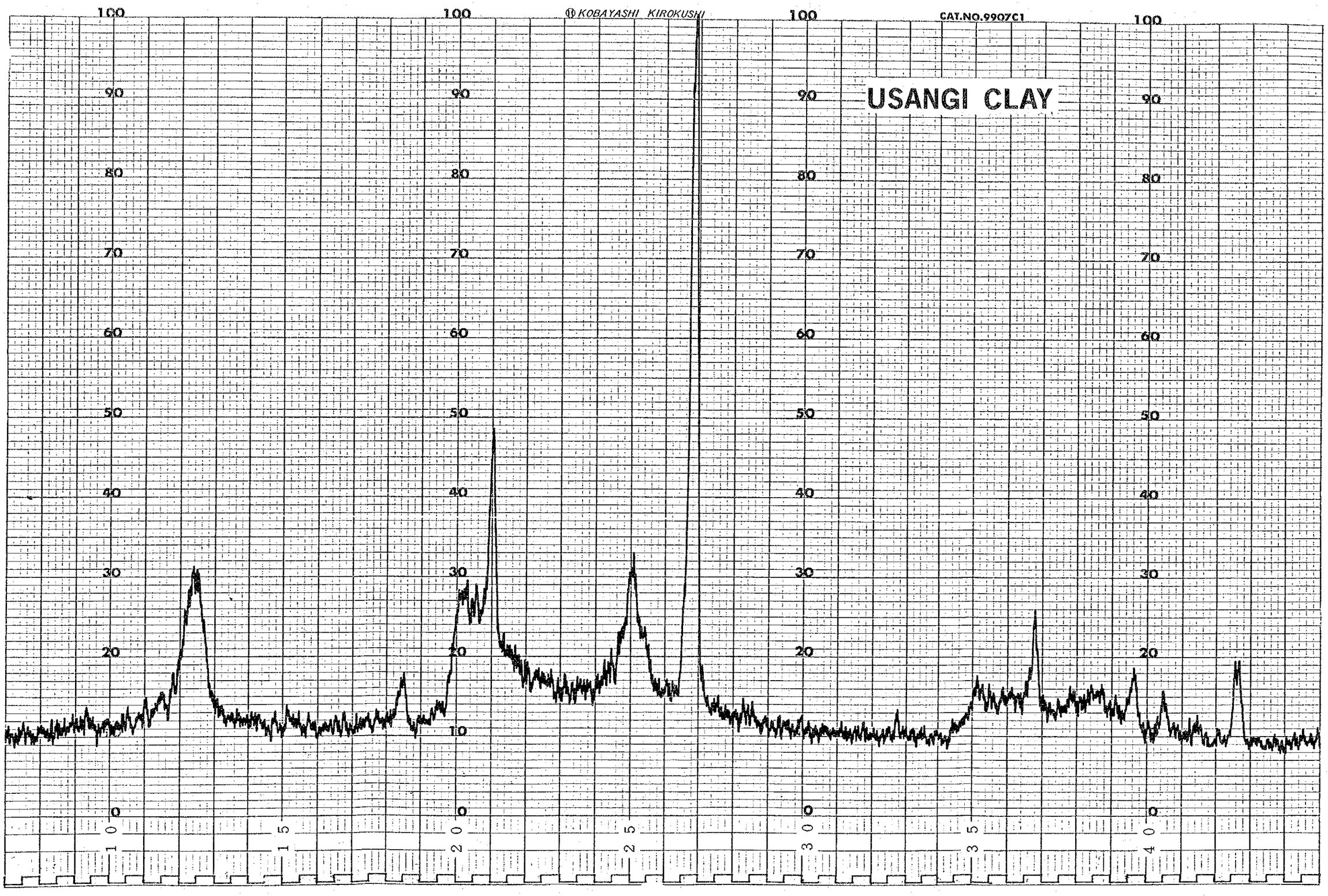
CAT.NO.9907C1

KOBAYASHI KIROKUSHI

CAT.NO.99

TONA CLAY




KOBAYASHI KIROKUSHI
CAT.NO.9907C1
USANGI CLAY
100
90
80
70
60
50
40
30
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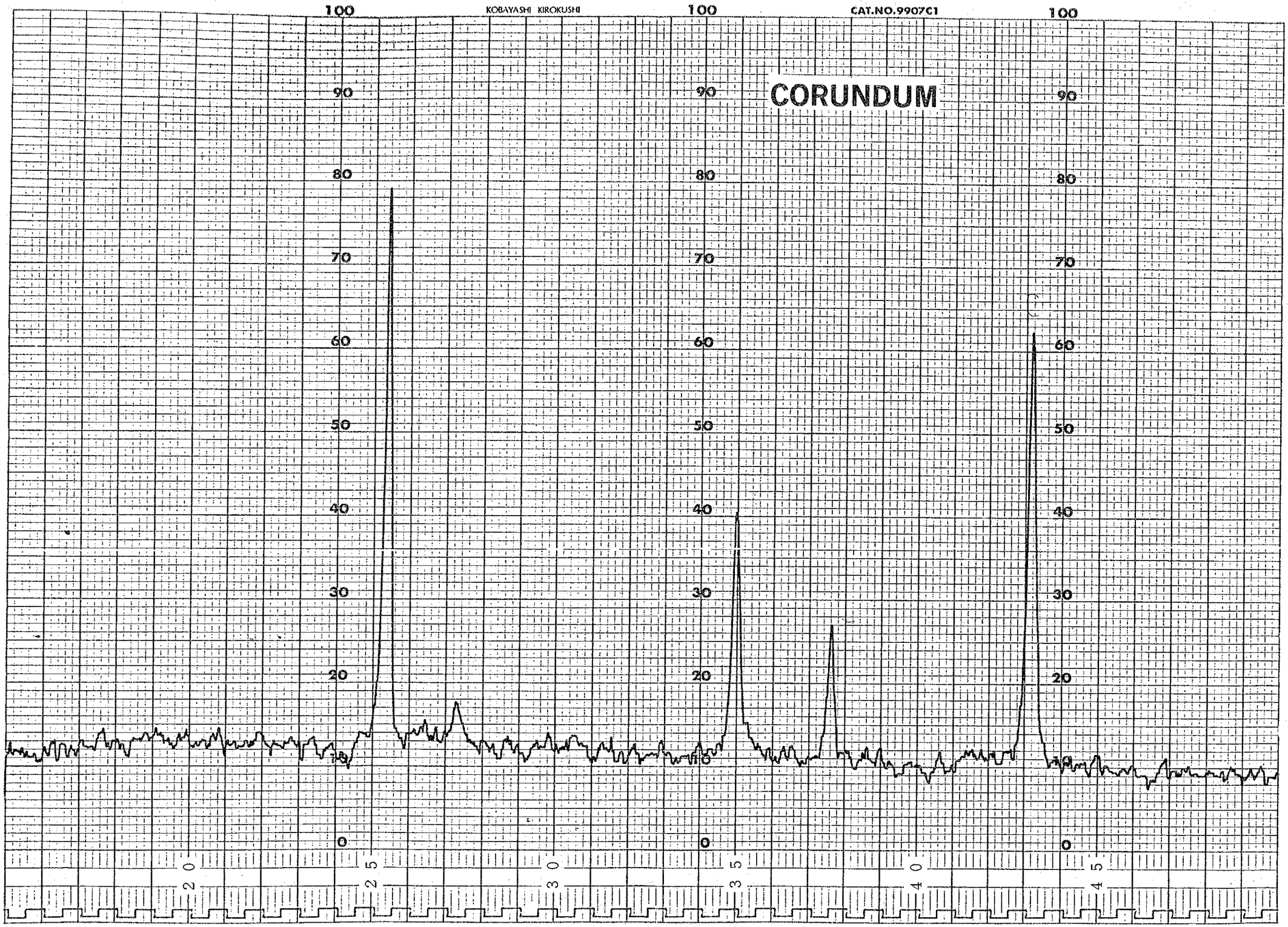
0
10
15
20
25
30
35
40

KOBAYASHI KIROKUSHI

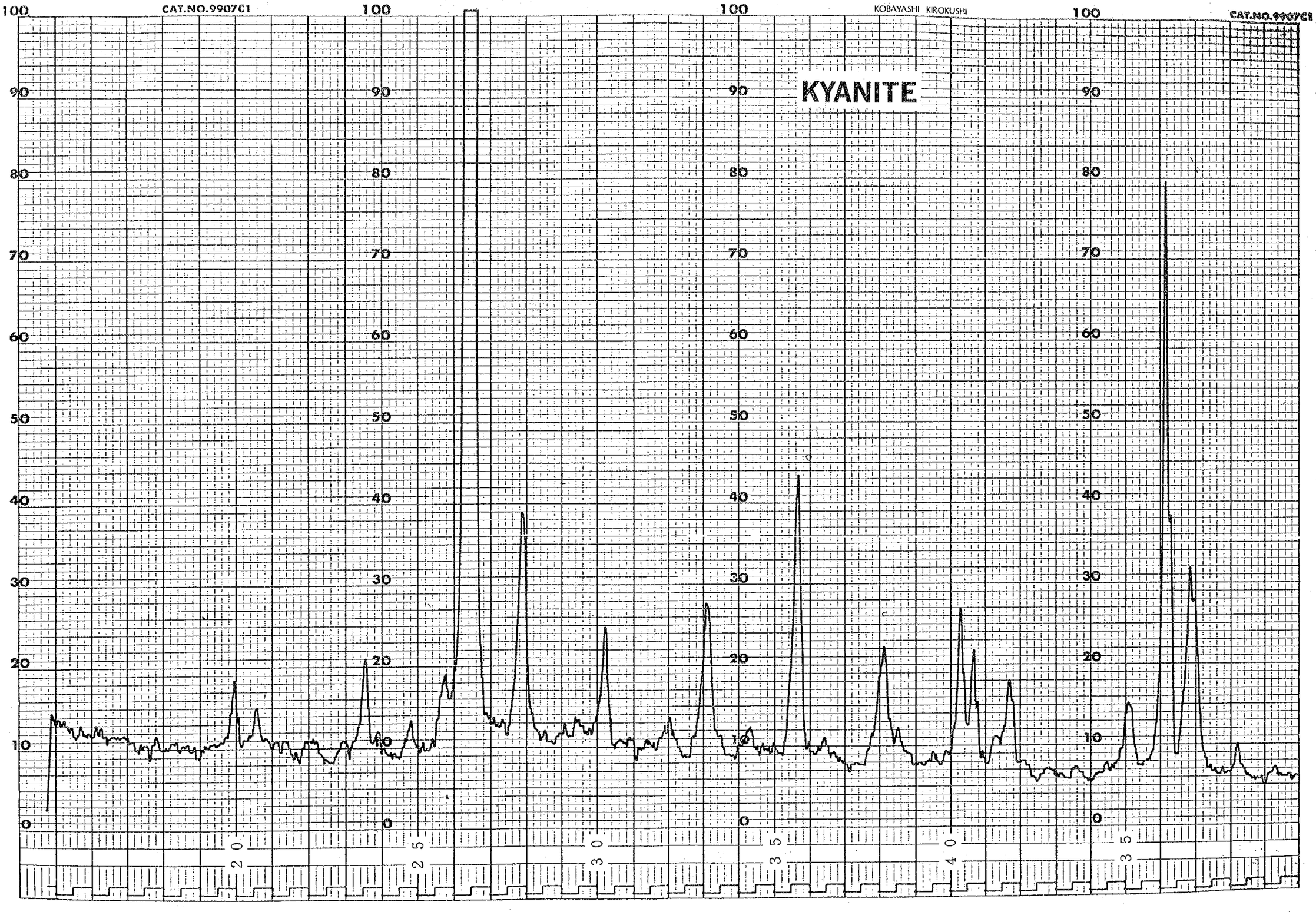
CAT.NO.9907C1

CORUNDUM



CAT.NO.9907C1 KOBAYASHI KIROKUSHI CAT.NO.9907C1

KYANITE

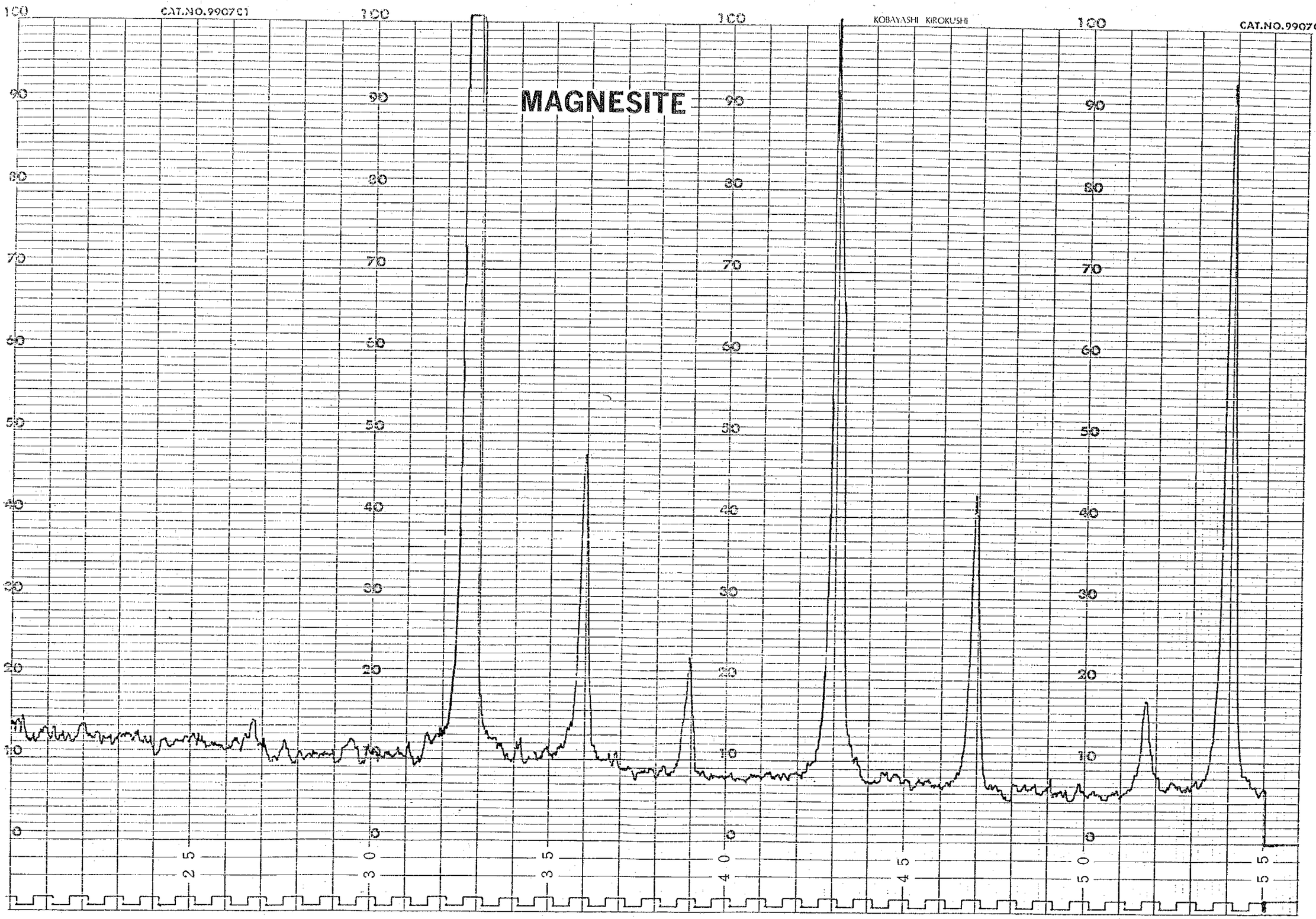


CAT.NO.9907C1

KOBAYASHI KIROKUSHI

CAT.NO.9907C1

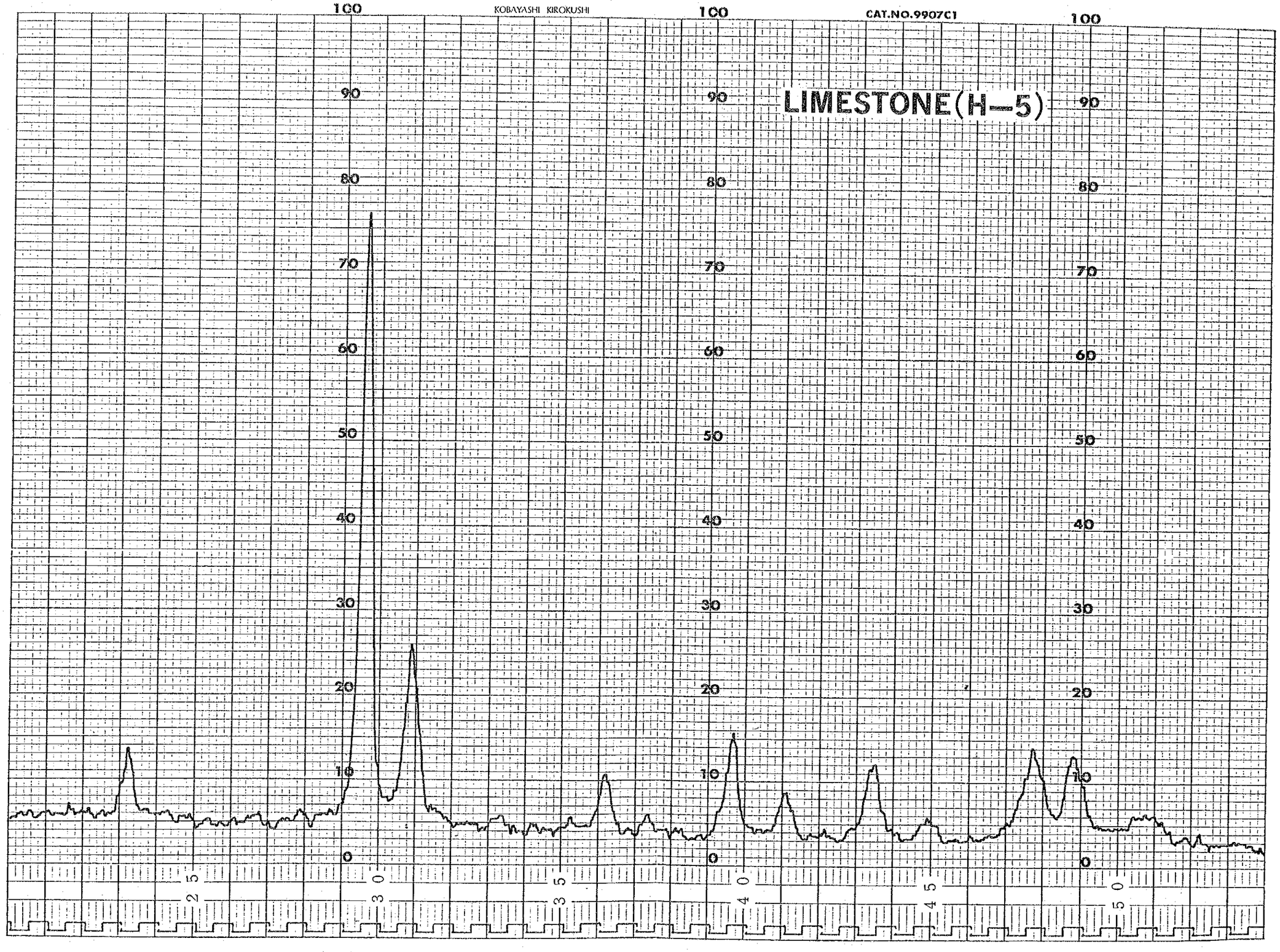
MAGNESITE



KOBAYASHI KIROKUSHI

CAT.NO.9907C1

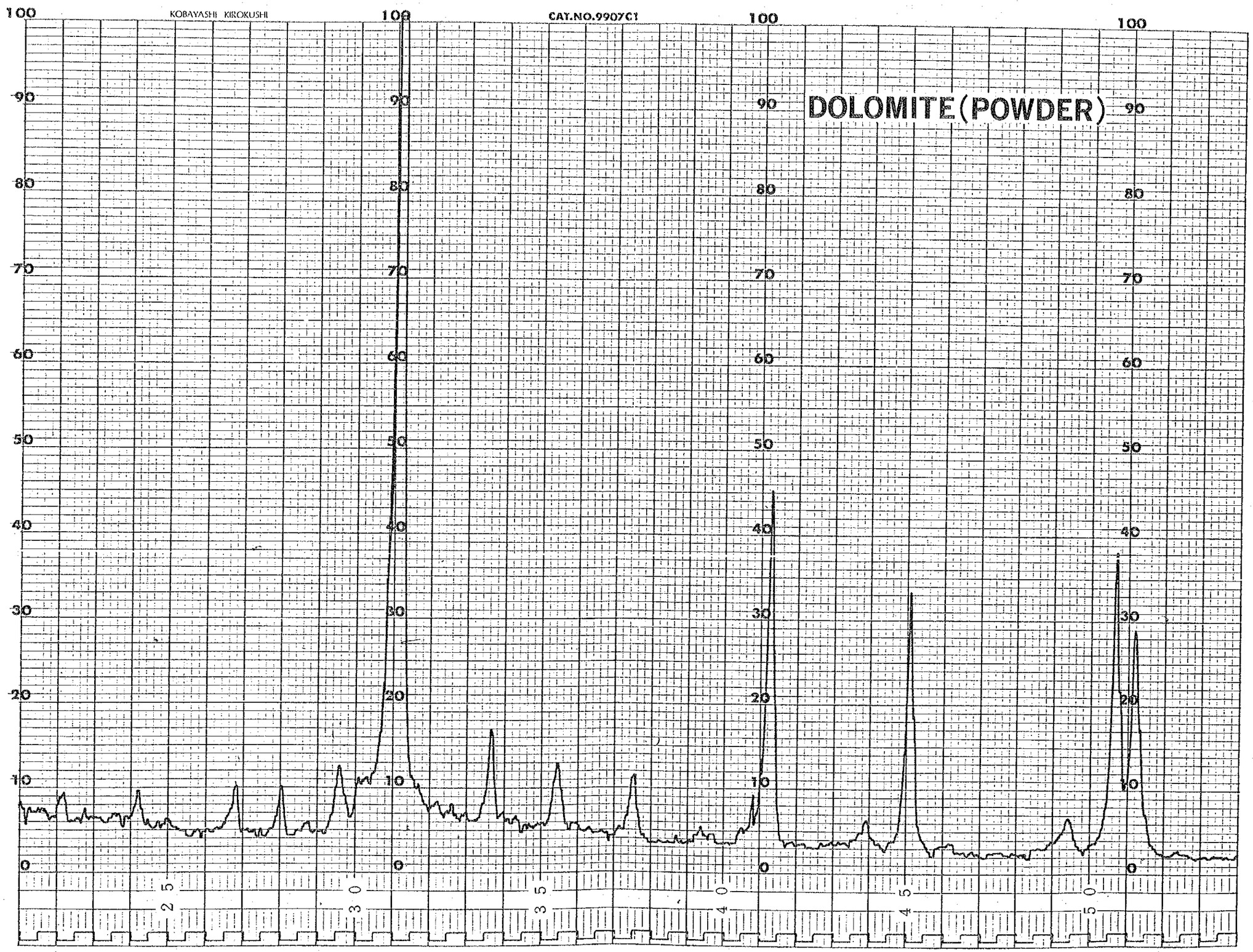
LIMESTONE (H—5)



KOBAYASHI KIROKUSHI

CAT.NO.9907C1

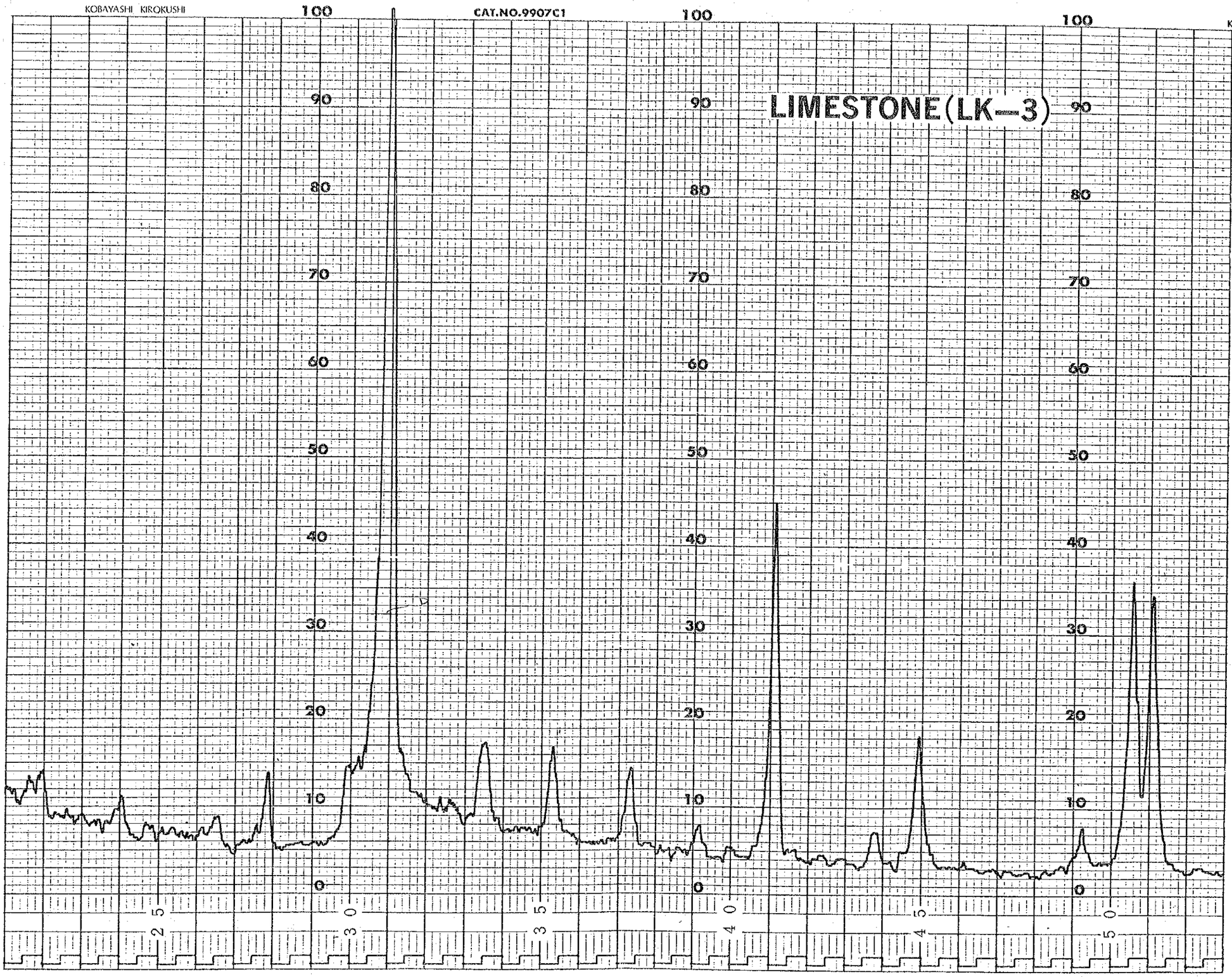
DOLOMITE(POWDER)



KOBAYASHI KIROKUSHI

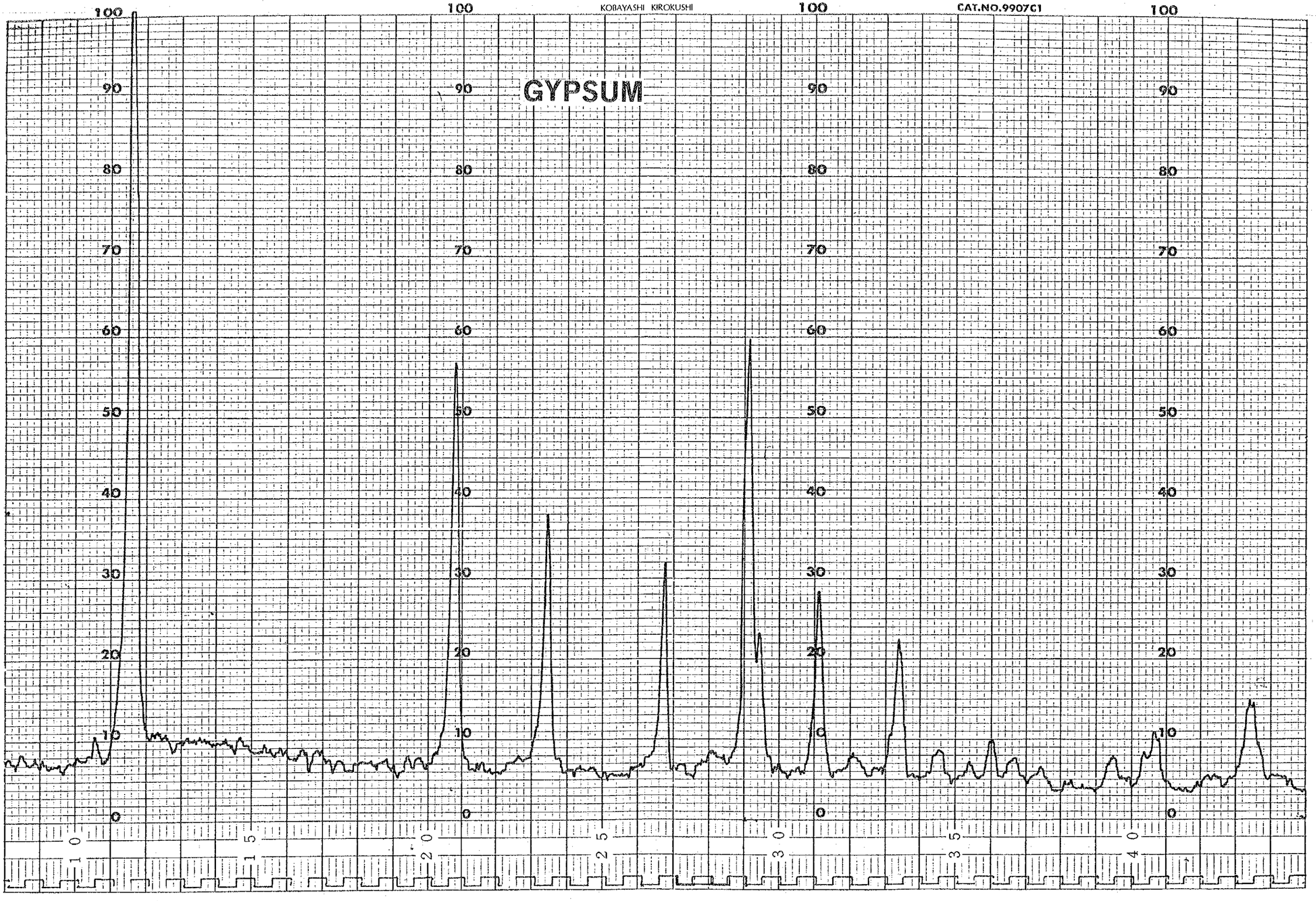
CAT.NO.9907C1

LIMESTONE (LK-3)



KOBAYASHI KIROKUSHI CAT.NO.9907C1

GYPSUM

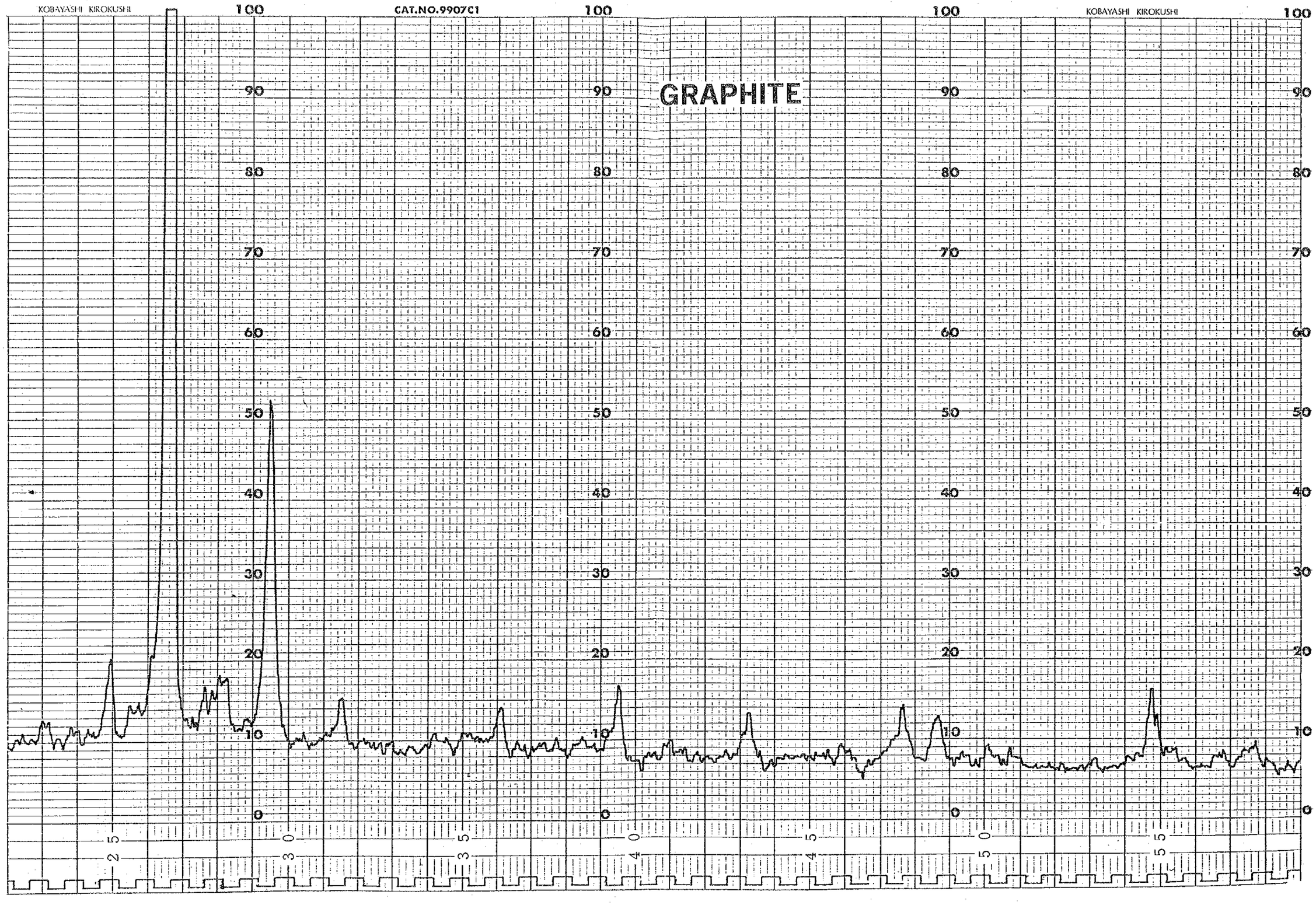


KOBAYASHI KIROKUSHI

CAT.NO.9907C1

KOBAYASHI KIROKUSHI

GRAPHITE



(6) Electron Microscopic Observation

(i) Raw Materials :

The observations were made on Usangi clay, Tona clay, Tona clay white and Pugu kaolin. As to clays, specimens were prepared by elutriation process.

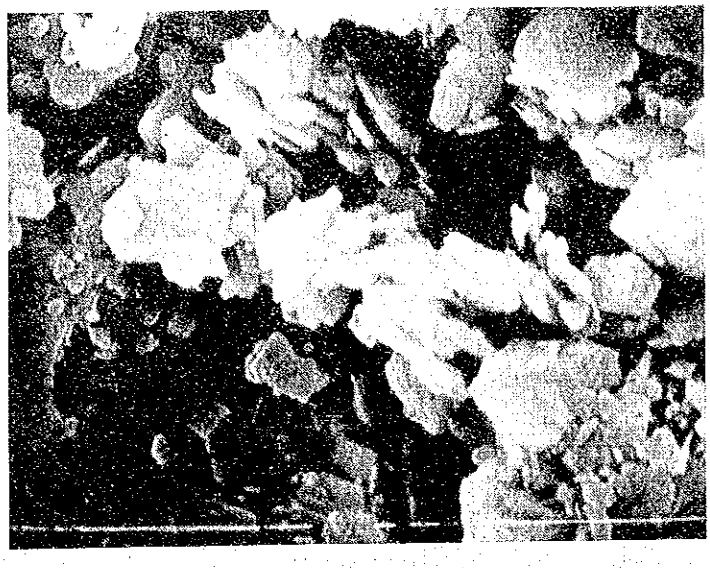
(ii) Test Result :

The test results are shown in Table 8, and the photographs are shown in Photo 1 thru Photo 4.

Table 8 Electron microscopic observation

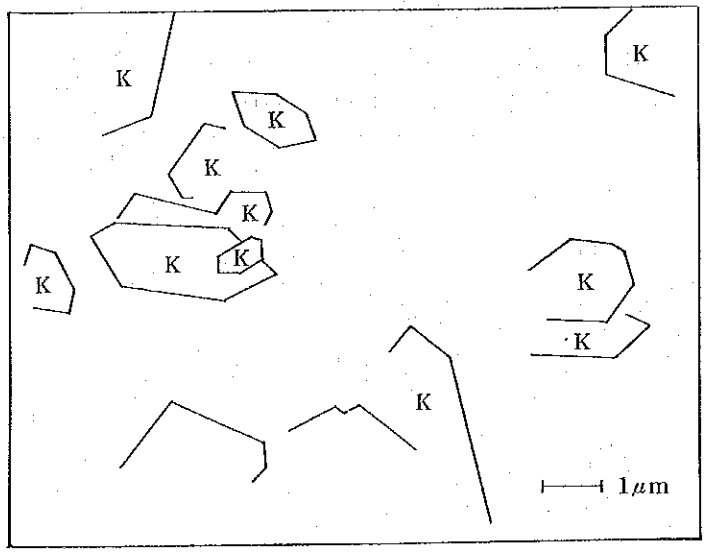
Specimen	Place of Sampling	Form of Crystal	Remarks
Pugu Kaolin	Pugu Hill	Composed of hexagonal plate-like kaolinite of high crystallinity. Size of crystal is about 1 – 2 μ.	Kaolin was refined at mine site.
White Part of Tona Clay	Tona in South Pare mountain system	Composed of hexagonal plate-like kaolinite of somewhat low crystallinity. Size of crystal is about 1 – 2 μ.	The part which has a white-color appearance.
Average Sample of Tona Clay	Tona in South Pare mountain system	Composed of kaolinite of low crystallinity. Size of crystal is about 1 μ.	
Average Sample of Usangi Clay	Usangi in North Pare mountain	Composed of low-crystallinity kaolinite and strip-like halloysite. Size of kaolinite crystal is approx. 0.5 μ and that of halloysite about 0.3 μ.	

Photo ; Electron micrographs



X 10,000

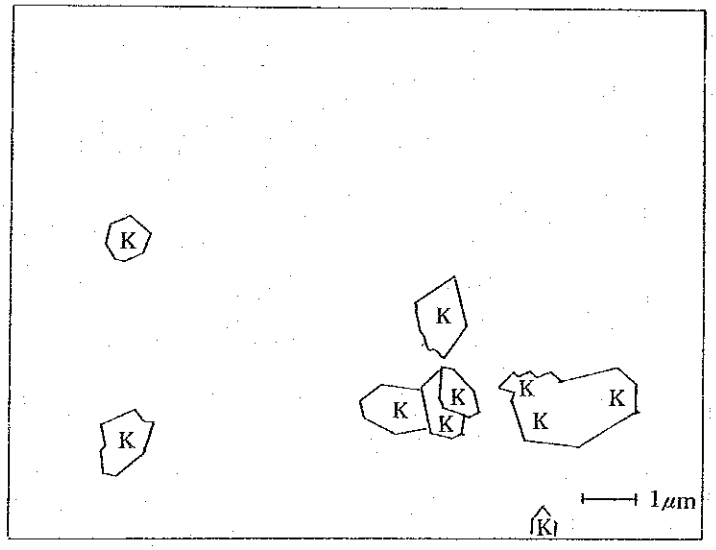
Photo 1–1 PUGU Kaolin



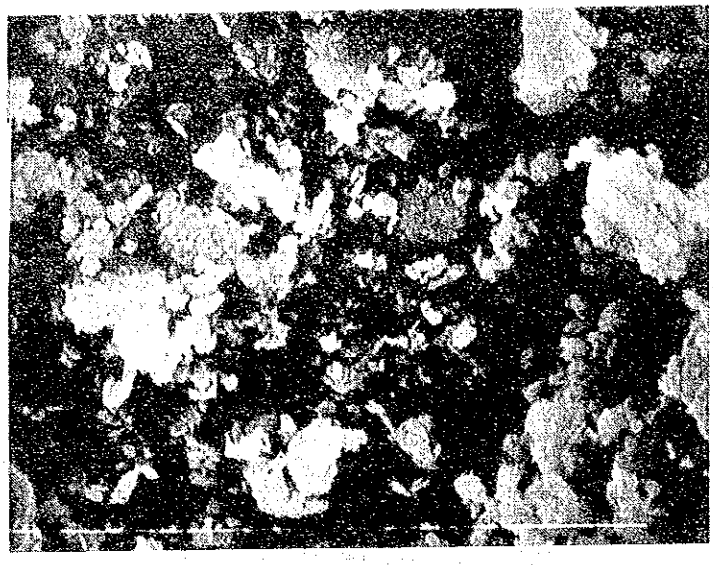
K : Kaolinite

X 10,000

Photo 1–2 TONA Clay, White Part

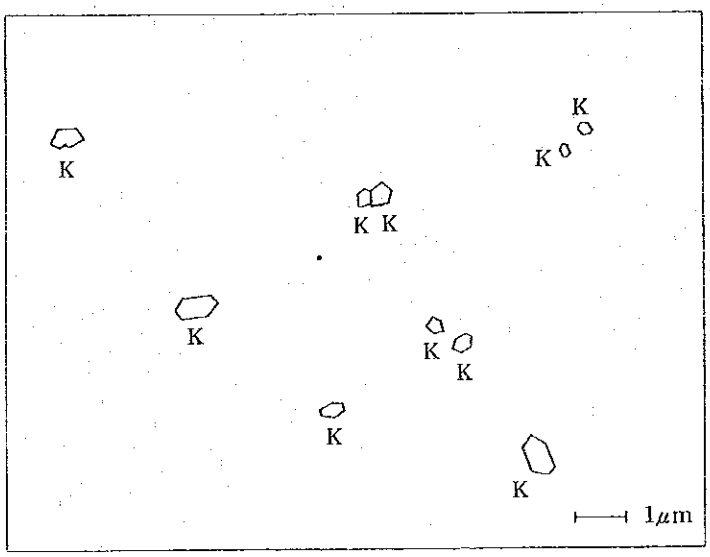


White Part of Tona Clay

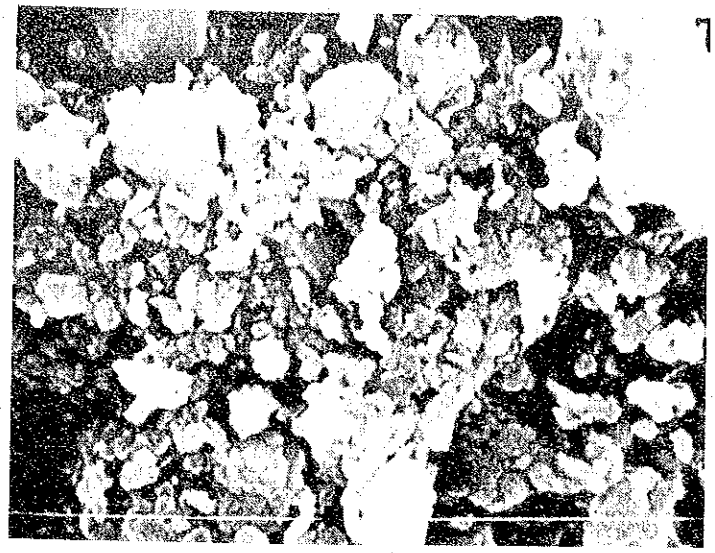


X 5,000

Photo 1–3 TONA Clay

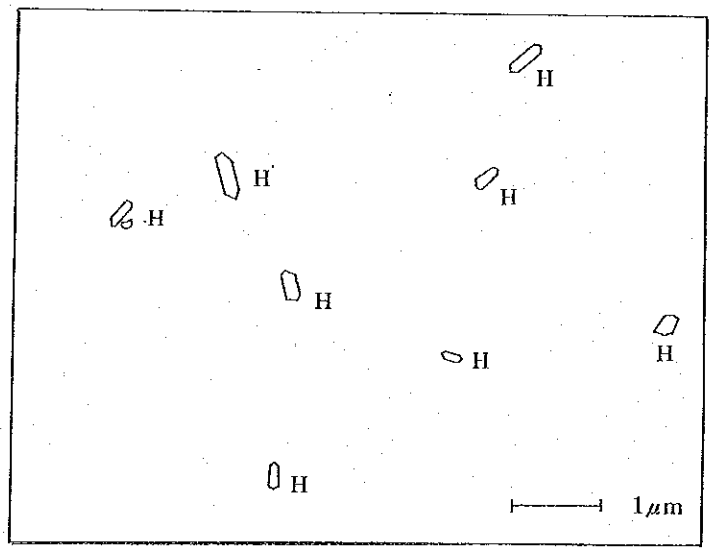


Tona Clay



X 15,000

Photo 1–4 USANGI Clay



H : Halloysite

(7) Viscosity Test

The viscosity tests were conducted on clay and kaolin.

(i) Specimen :

Specimens were prepared in such a manner as to dry the raw materials and grind them by a grinding mill to grain sizes under 0.5 millimeters.

(ii) Measurement :

A specimen is put into a beaker and supplied with water in a fixed quantity. Poise is read by measuring torque when a cylinder is turning at a fixed speed. Viscosity was measured by a direct-reading type viscometer.

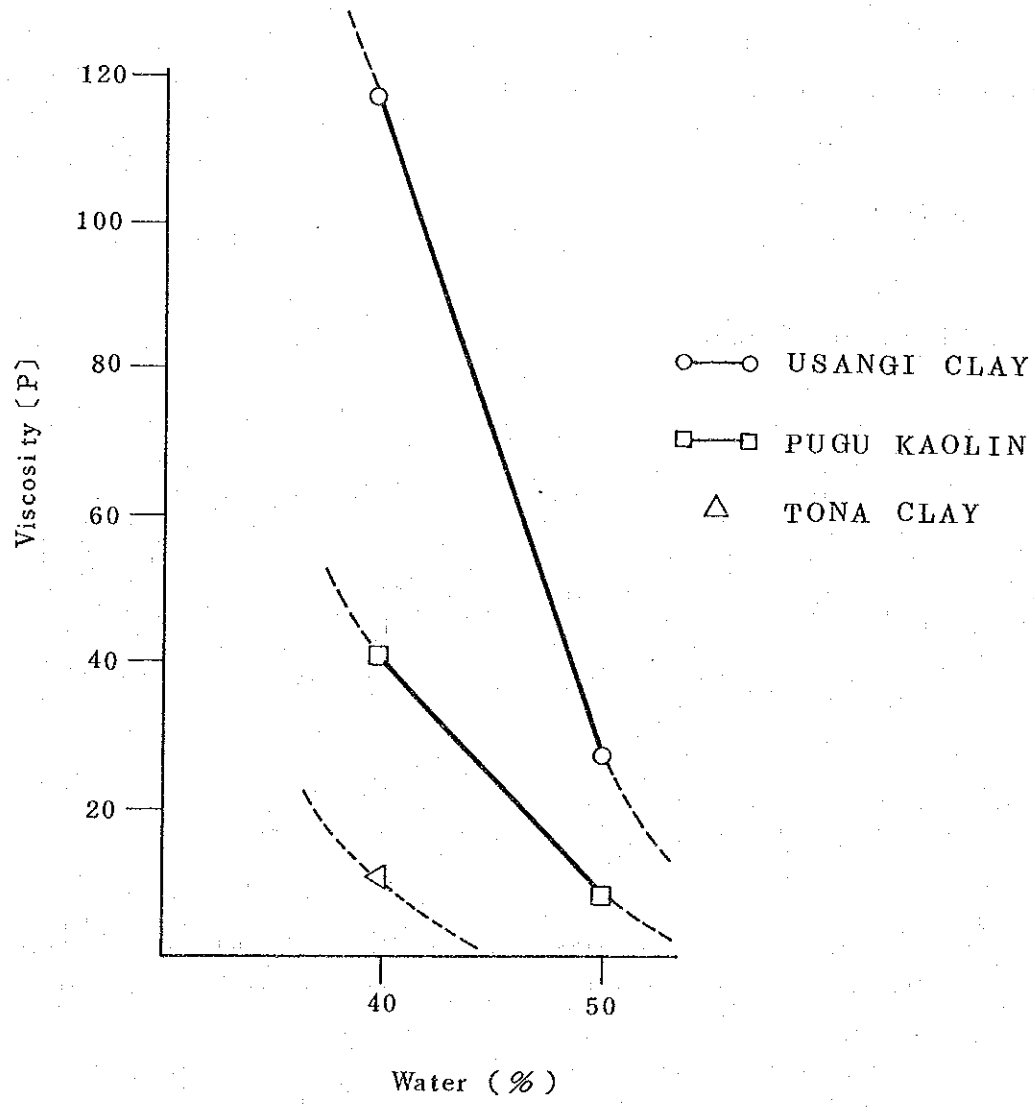
(iii) Result :

Results of the measurements are shown in Table 9 and Fig. 5.

Table 9 Test result of viscosity

Specimen Name	Weight of Specimen (g)	Volume of Water Added (cc)	Water Content (%)	Cylinder Used	Time Continued (seconds)	Room Temperature (°C)	Viscosity (Poise)
TONA CLAY	250	166	40	No. 3	10	17	11.5
	250	250	50	—	—	—	Not measured
USANGI CLAY	250	166	40	No. 2	10	17	117.0
	250	250	50	1	8	17	27.5
PUGU KAOLIN	250	166	40	1	10	18	40.0
	250	250	50	3	10	18	9.0

Fig. 5 Test result of viscosity



3. Preliminary Trial Production Test

For tablewares use, there are three kinds of chinawares in general, i.c., Porcelain, earthenware and stoneware. These chinawares are also classified into two by outlook, i.e., white and coloured. From test results, these raw materials were considered not to be suitable for white chinaware. On the basis of a judgement that it is very possible for these raw materials to be used for making colored stoneware, the following trial production test on stoneware was conducted.

(1) Raw Material :
Average sample of Tona and Usangi clays, Kihurio feldspar and Pugu kaolin were used.

(2) Batch Ratio :
The batch ratio of body is shown in Table 10.

Table 10 Batch ratio of body

SAMPLE	Batch Ratio (%)		
	TA	TB	TC
TONA CLAY	20	0	30
USANGI CLAY	20	30	30
PUGU KAOLIN	30	40	20
KIHURIO FELDSPAR	30	30	20

(3) Body Preparation :
The aforementioned 3 kinds of batches were put into a pot mill ground by wet process for 24 hours. All the particles passed 200-mesh screen without leaving any residual at all.

(4) Dehydration :
Thus prepared body (slip) was poured into a plaster mold and left untouched for a day or two for dehydration.

(5) Shaping :
Thus wet body taken out from the plaster mold was kneaded homogeneously by hands, and then, made into slice. The slice was formed into coffee cup and saucer by hand jiggering machine.

(6) Drying :
After having been allowed to dry naturally for several hours, the green ware was forcibly dried by a dryer.

(7) Biscuit Firing :
Biscuit firing of the dried green ware was made in a small-size electric kiln at approx. 800°C.