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DEPARTMENT OF ENERGY, MINES AND RESOURCES

OTTAWA

MINES BRANCH INVESTIGATION REPORT IR 66-80

EXAMINATION OF LEAD-META-NIOBATE SAMPLES SUBMITTED BY DUPLATE CANADA LIMITED RESEARCH LABORATORIES, OSHAWA, ONT.

by

A. A. WINER

MINERAL PROCESSING DIVISION

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SUMMARY OF RESULTS

Six lead-meta-niobate samples from Duplate Canada, Limited, were examined using the Quantitative Television Microscope and other microscopic techniques, to determine whether they contained more than one phase. Each sample consisted of at least two phases. In addition, voids were formed during preparation of the polished section containing the six samples.

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INTRODUCTION

Six samples of lead-meta-niobate (LMN) with varying concentrates of Niobate (Nb_2O_5) were submitted by K.W. Frickert of Duplate, Canada, Limited for examination to determine whether more than one phase was present.

The Nb_2O_5 contents of the samples are listed in Table 1.

TABLE 1

NIOBATE CONTENT

Duplate Sample No.	Nb_2O_5 Content Mol Per Cent
887	51
383	52
1055	53
734	53
1008	55.5
998	66.6

SAMPLE PREPARATION

Polished sections of the samples were prepared by the Ore Mineralogy Section. These are shown in Figure 1.

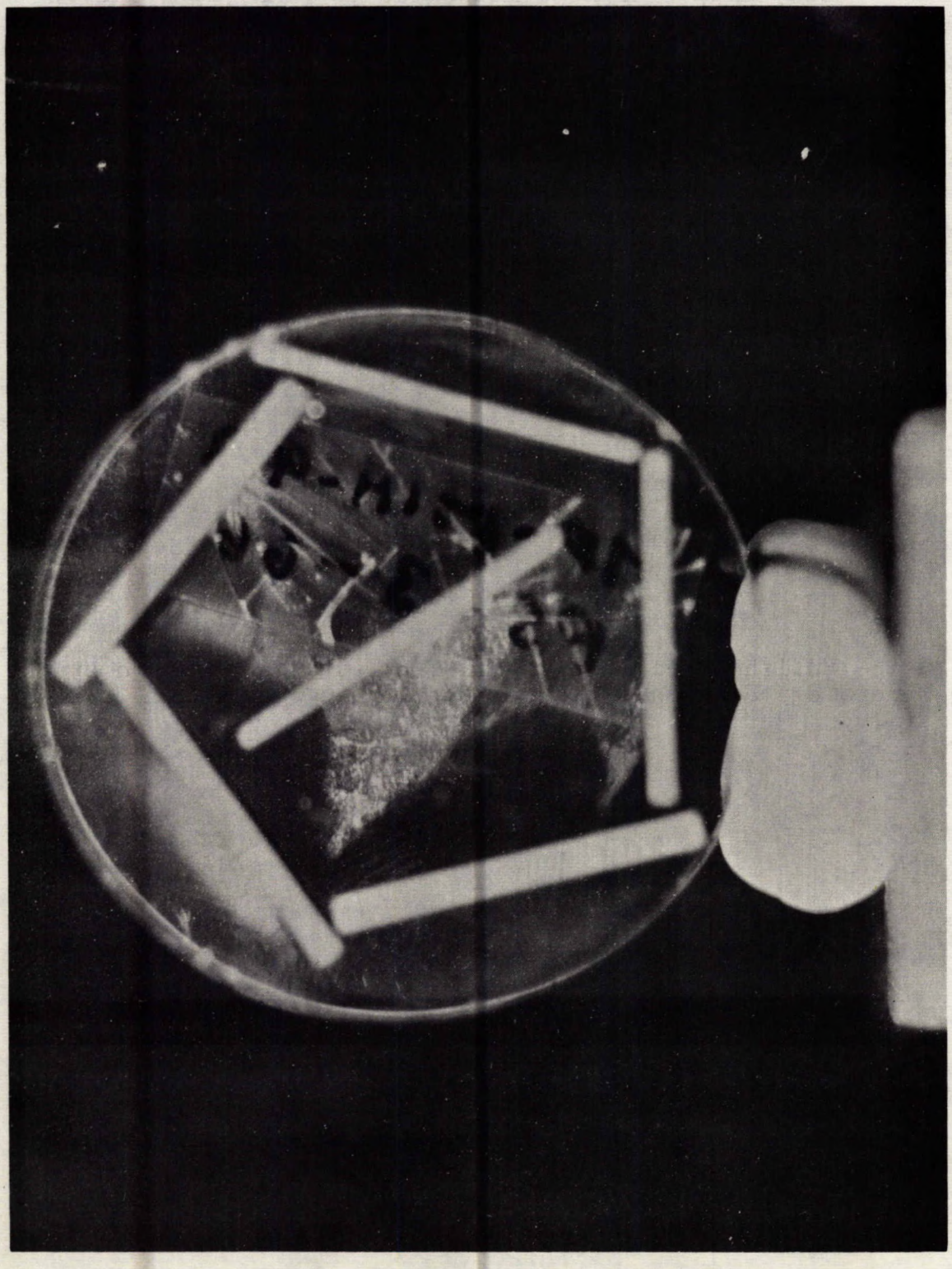

Figure 1. Polished SECTIONS of Lead-Meta Niobate Samples.

EXAMINATION BY QUANTITATIVE TELEVISION MICROCOPE (QTM)

The polished sections were viewed with the QTM and photographs obtained from the T.V. viewing screen using P/N55 Polaroid film. Enlargements of the photographs are shown in Figures 2 to 8. A cross-reference of Figures and Samples follows:

Figure No.	Sample No.
2	887
3	383
4	1055
5*	734A
6*	734B
7	1008
8	998

* Figures 5 and 6 are two randomly selected areas of the same sample.

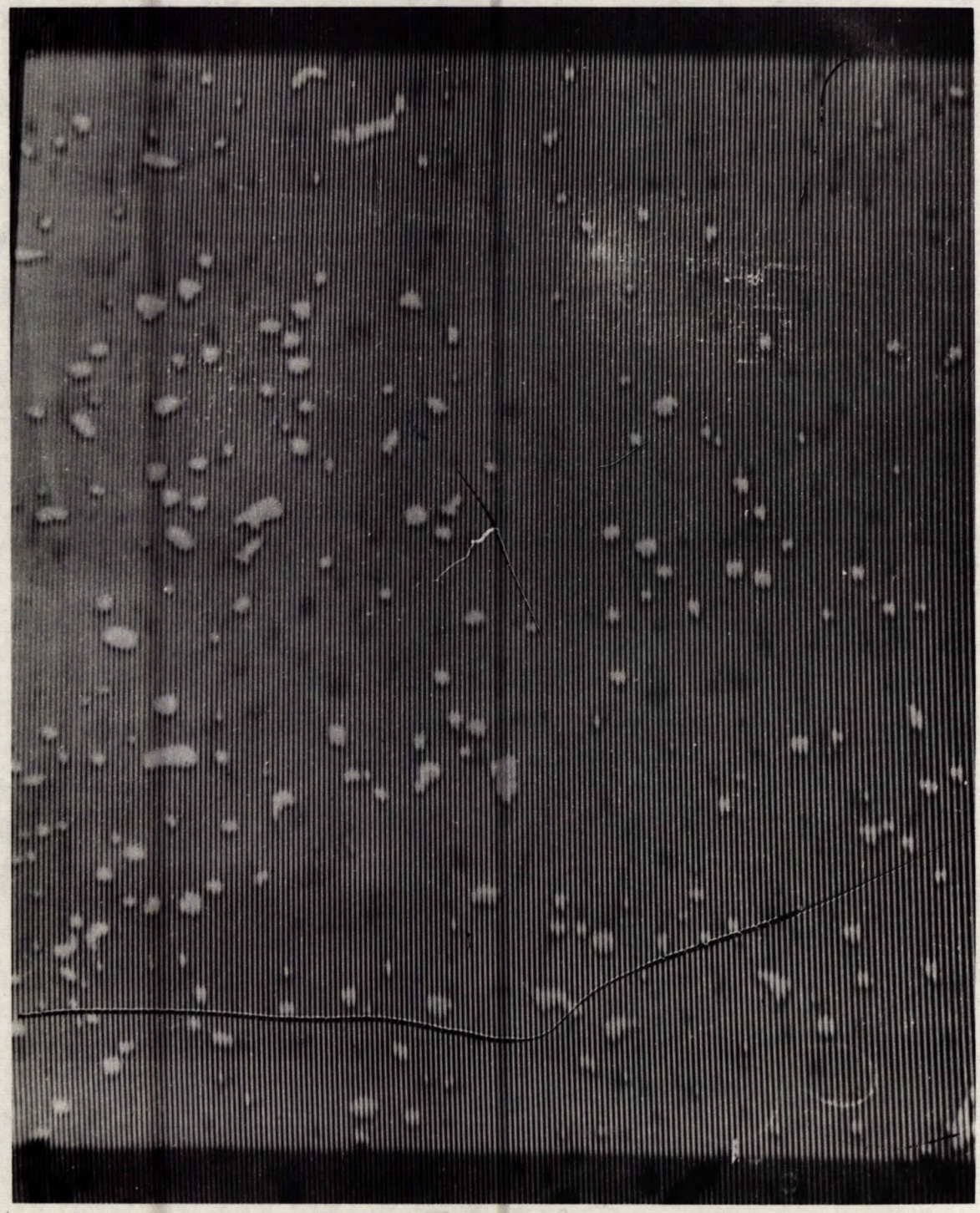

Figure 2. Q.T.M. PHOTOMICROGRAPH of Sample Number 887.

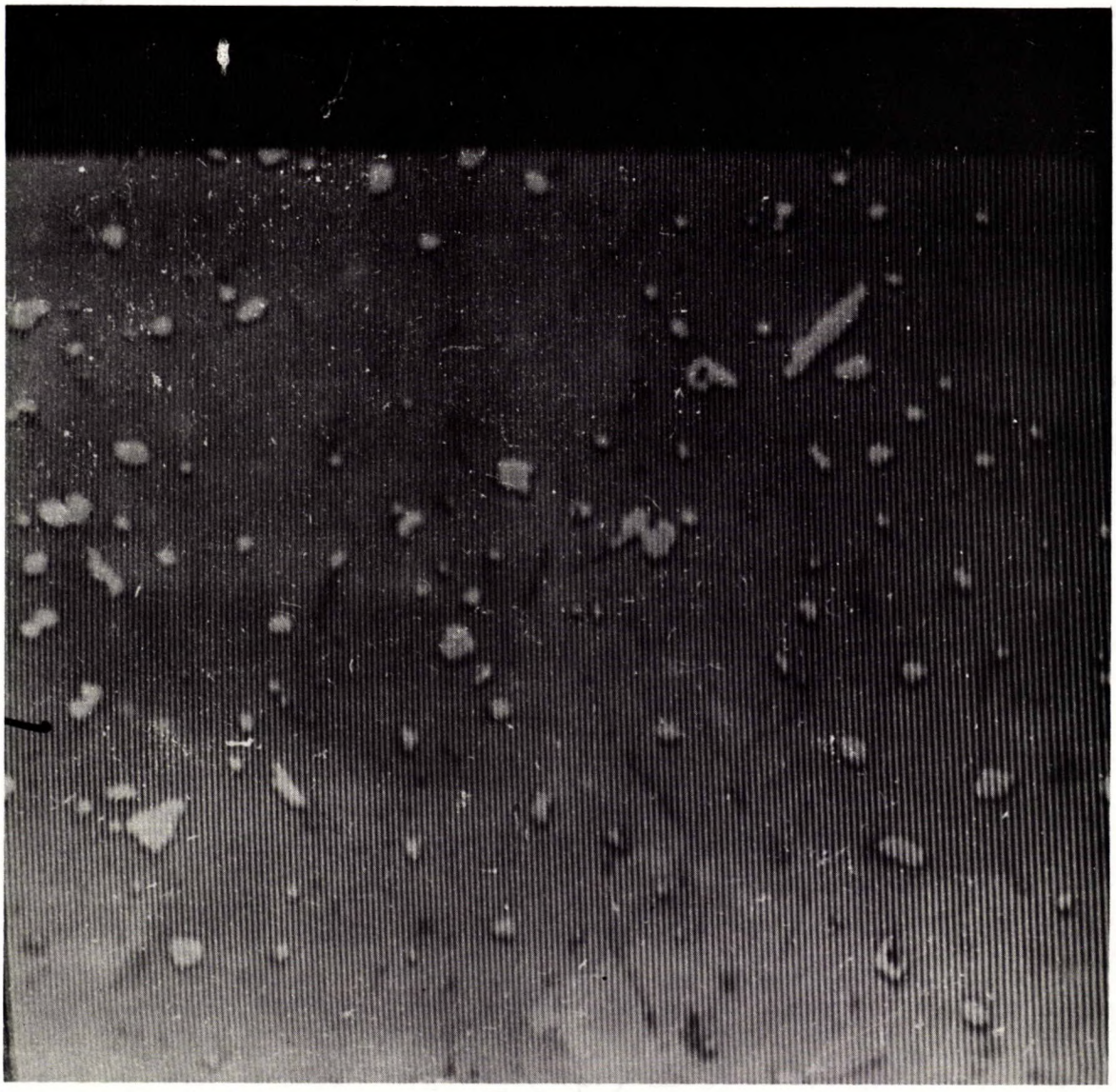

Figure 3. Q.T.M. PHOTOMICROGRAPH of Sample Number 383.

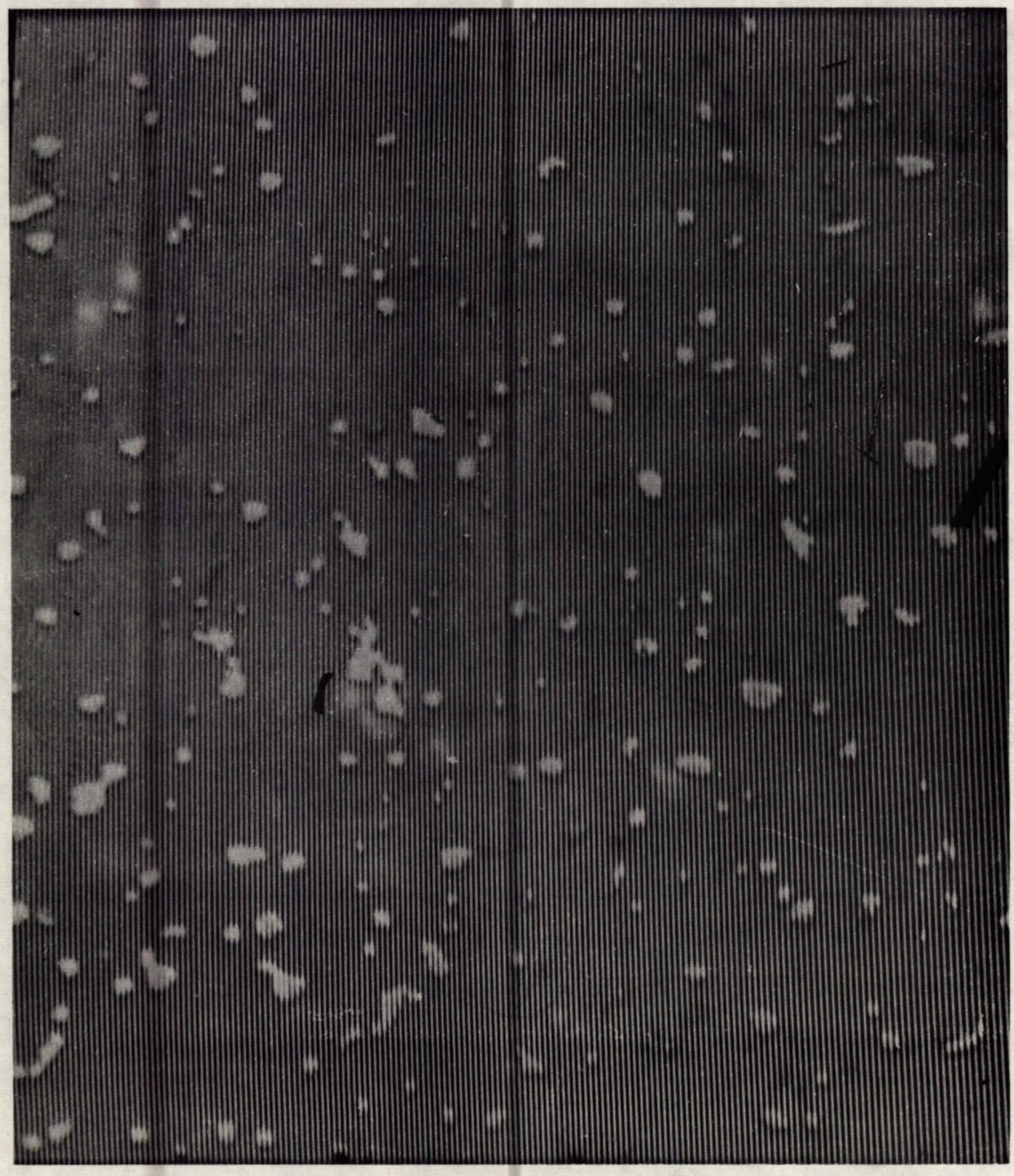

Figure 4. Q.T.M. PHOTOMICROGRAPH of Sample Number 1055.

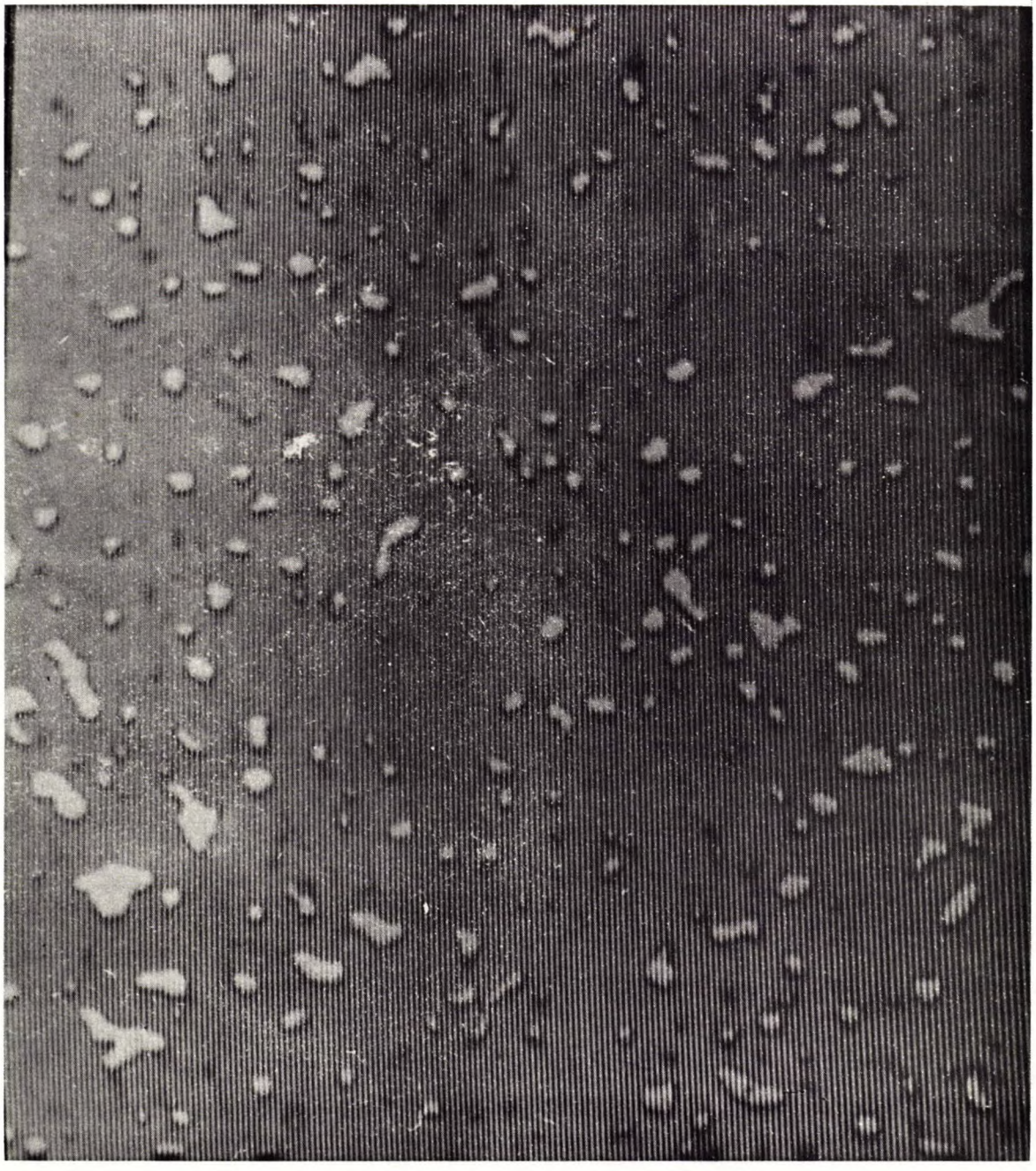

Figure 5. Q.T.M. PHOTOMICROGRAPH of Sample Number 734A.

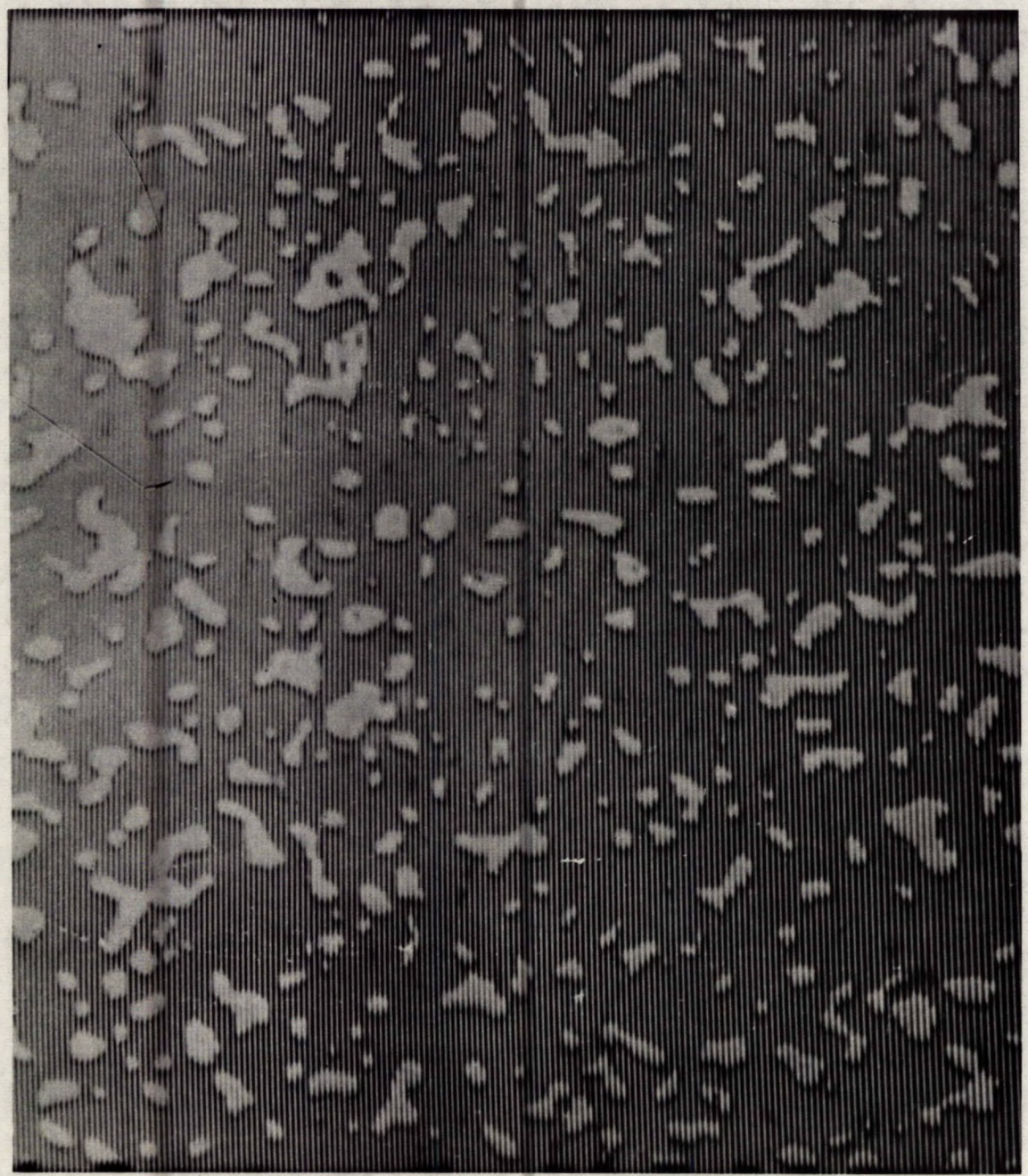

Figure 6. Q.T.M. PHOTOMICROGRAPH of Sample Number 734B

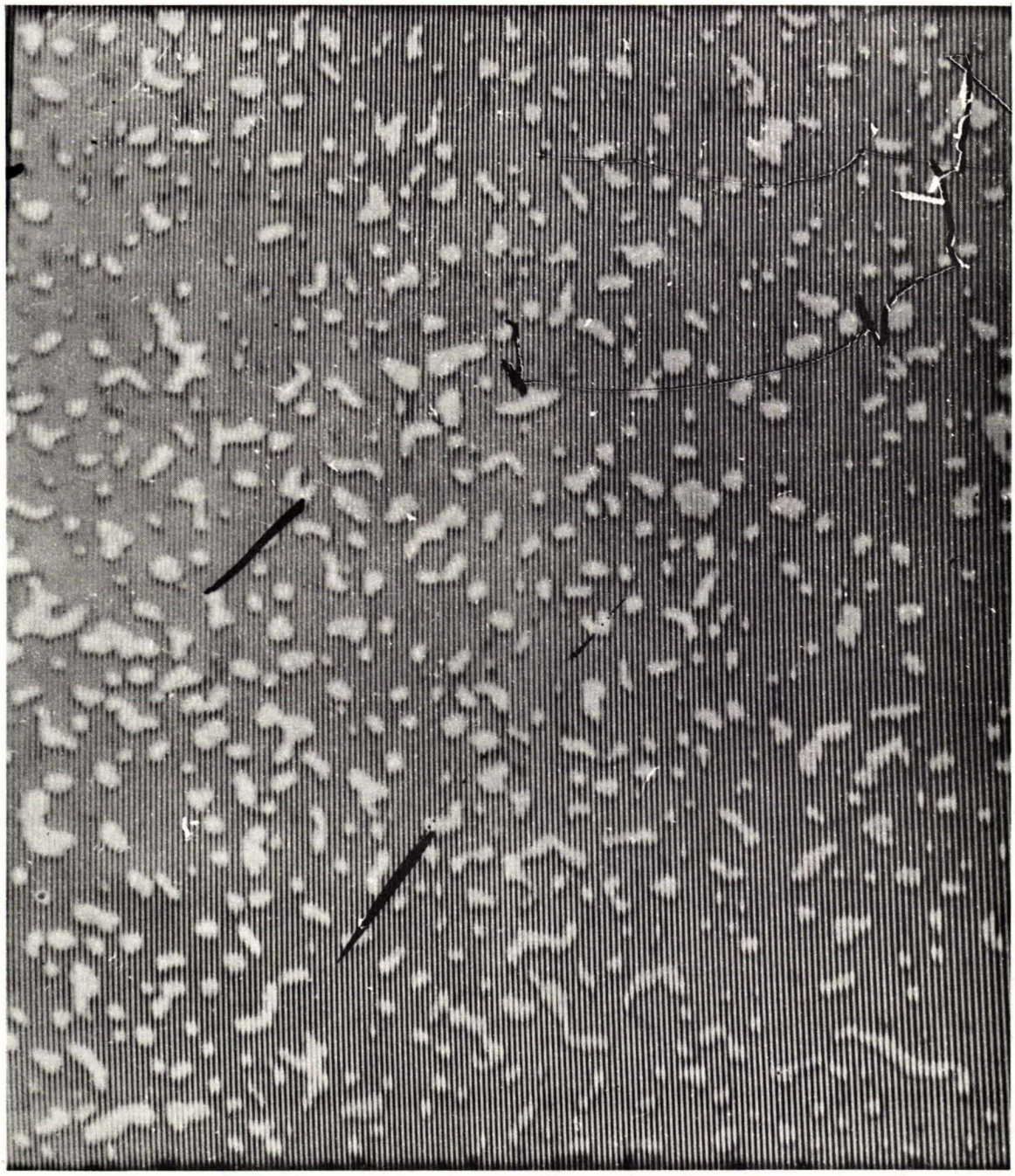

Figure 7. Q.T.M. PHOTOMICROGRAPH of Sample No. 1008.

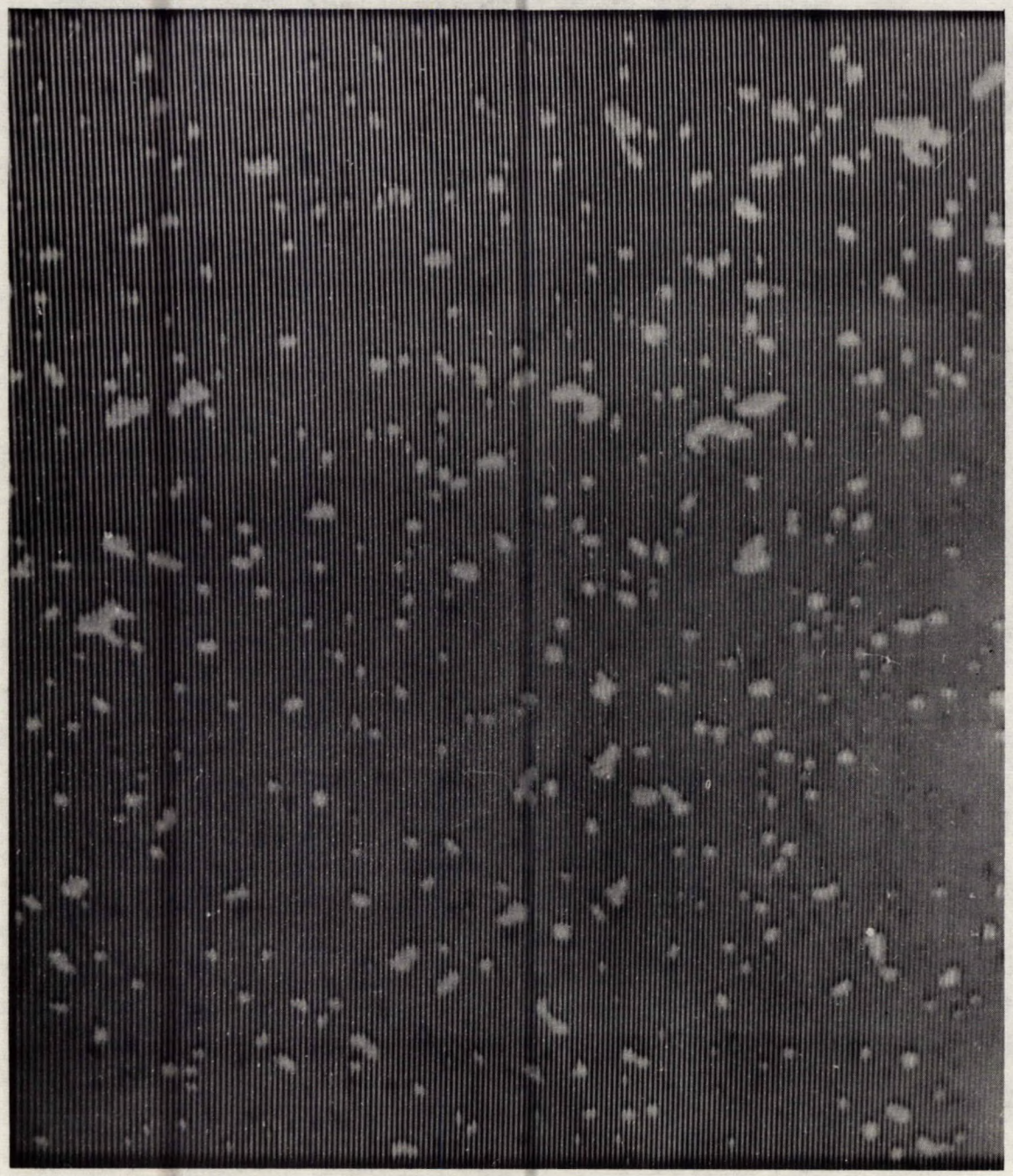

Figure 8. Q.T.M. PHOTOMICROGRAPH of Sample Number 998.

The portion of the photomicrograph under examination by the QTM is the bright rectangular area. Within this area appear white particulate matter. The area occupied by the particulate matter was measured by the QTM as a percentage of the total area examined. QTM scans were made randomly. However, the results for sample 734 varied drastically and therefore, more readings were made for this sample.

Table 2 summarizes the results of the scans.

TABLE 2

Areal Percentage Occupied by Particulate Matter

SAMPLE NO.	Area Per Cent					
	Scan Number					
	1	2	3	4	5	6
887	2.25	2.35	2.65	-	-	-
383	2.35	2.45	3.60	-	-	-
1055	3.60	3.90	-	-	-	-
734*	4.00	3.60	5.00	6.60	7.00	14.5
1008	12.5	13.5	-	-	-	-
998	3.30	3.40	3.30	-	-	-

* A series of scans, progressing from end to end of sample.

DISCUSSIONS AND CONCLUSIONS

The samples appeared to consist of at least two phases, one represented by the white particulate matter, the other by the matrix. However, further microscopic examination raised doubts. Although the particulate substances were thought to represent a second phase, they could also represent voids. Vertical incident lighting, conical lighting with the Ultropak, and dark field illumination were used to help define this problem. Polarizers were also used with vertical illumination. Sample 734 was selected for detailed examination.

Figure 9, a micrograph obtained using dark-field illumination, is similar to the image obtained with the QTM. Examination with vertical illumination resulted in the micrograph shown in Figure 10. Examination with polarizers resulted in the micrographs shown as Figures 11 to 14, which are interpreted as showing a second phase plus voids. These voids are more prominently shown in Figures 13 and 14 with polarizers crossed.

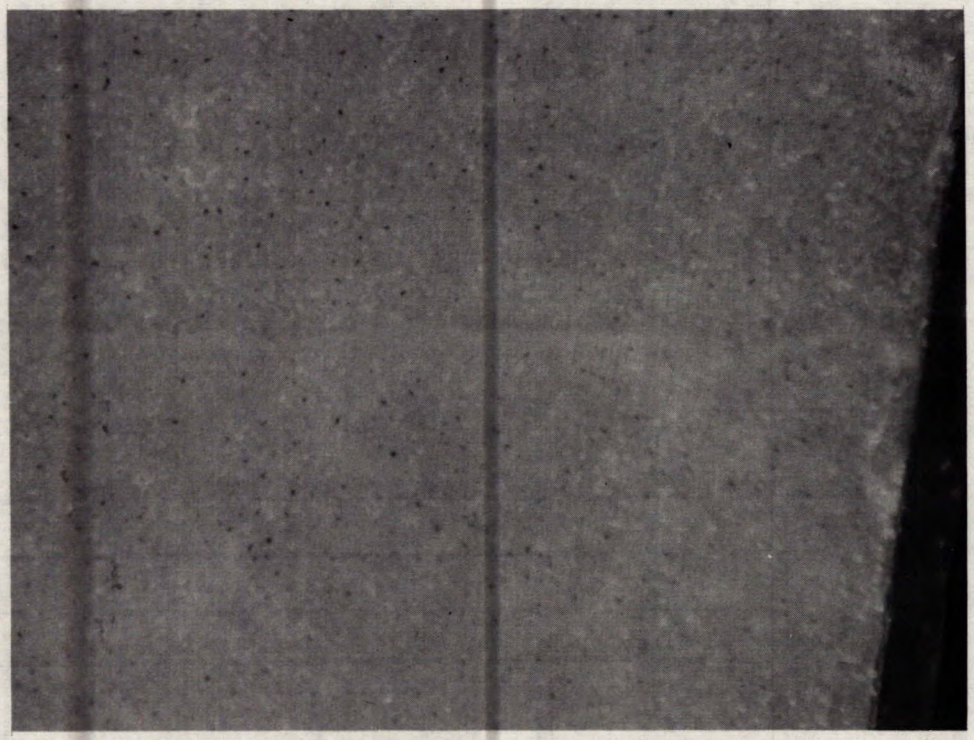

Figure 9. Dark Feld (Conical) Illumination X200.

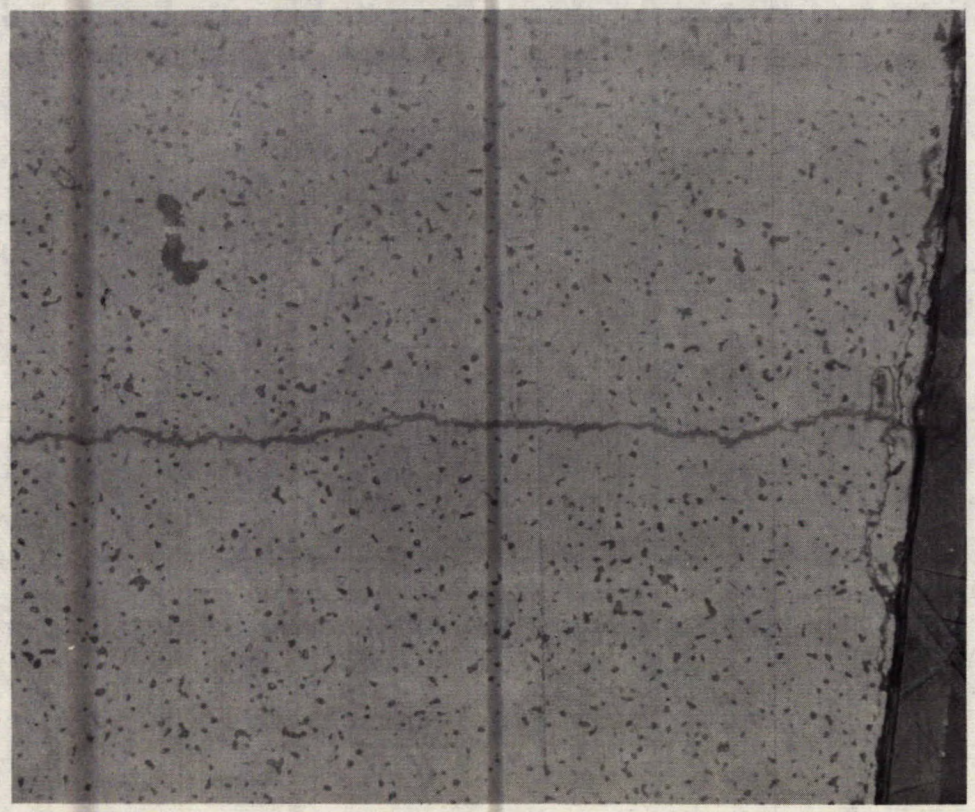

Figure 10. Vertical Illumination X200.

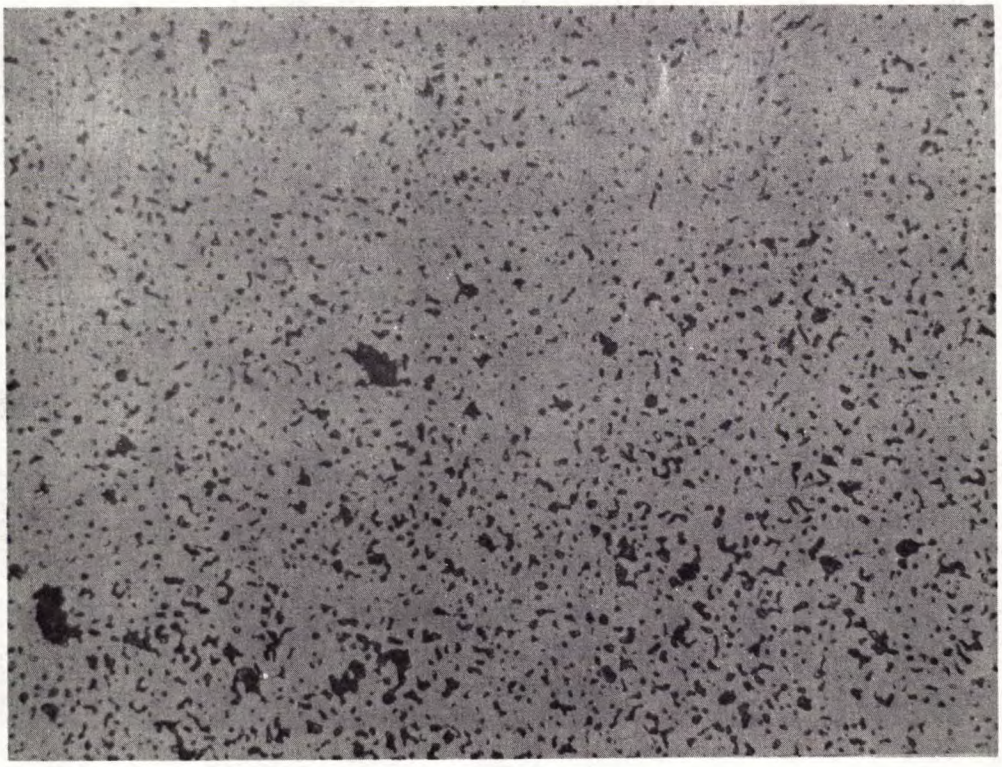

Figure 11. Polarizers Parallel X500.

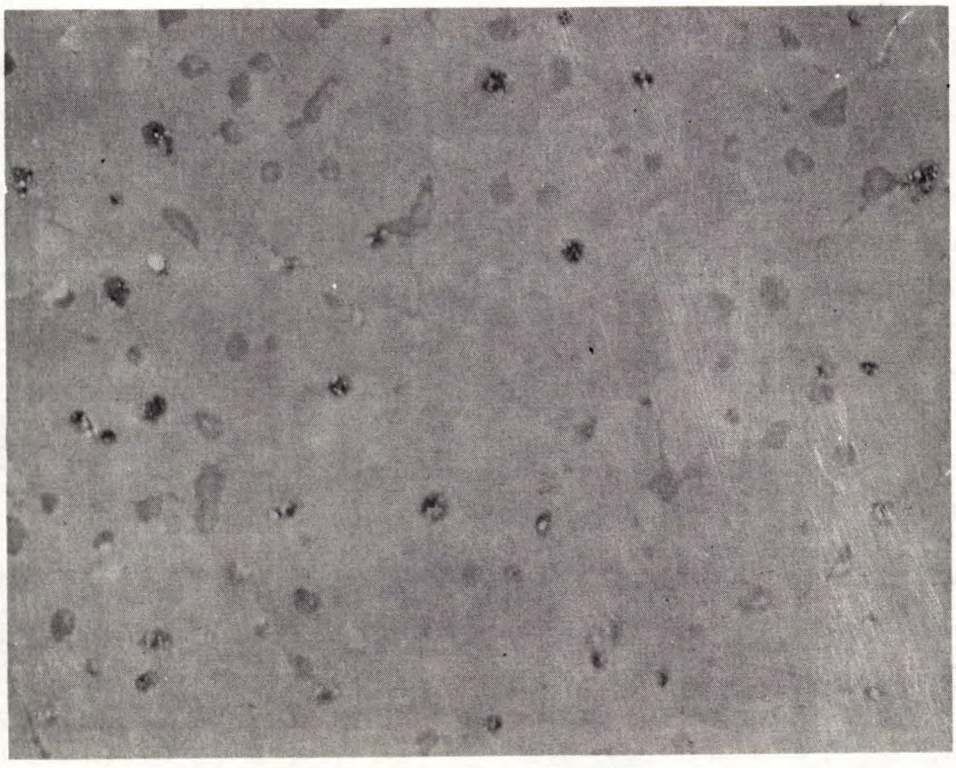

Figure 12. Polarizers Parallel X1000.

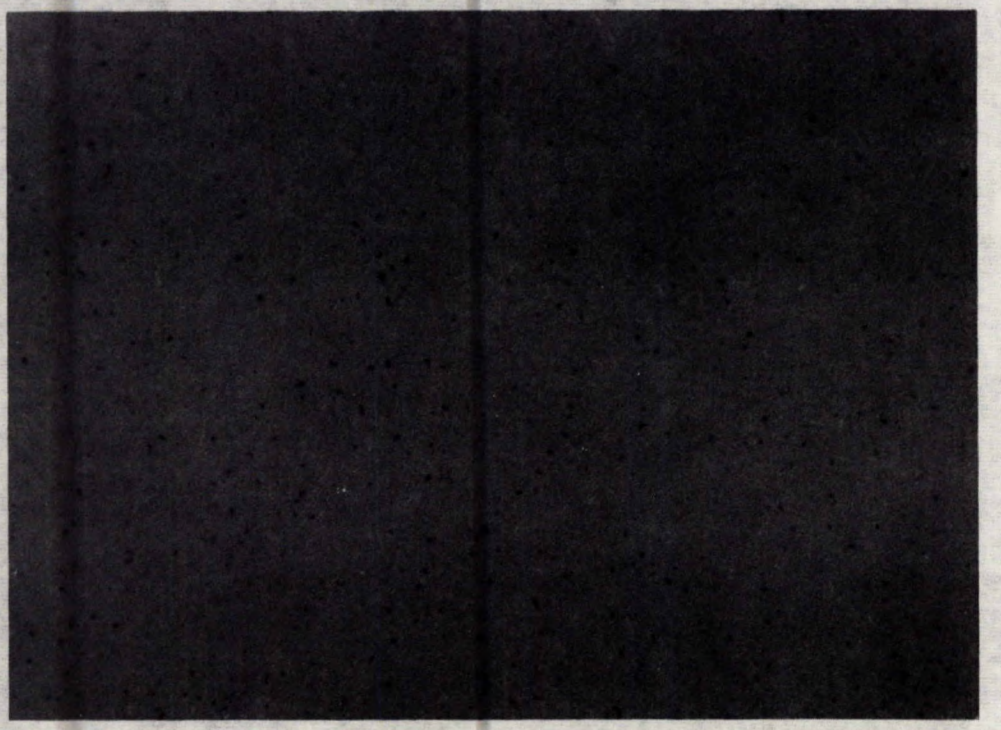

Figure 13. Polarizers Crossed X500.

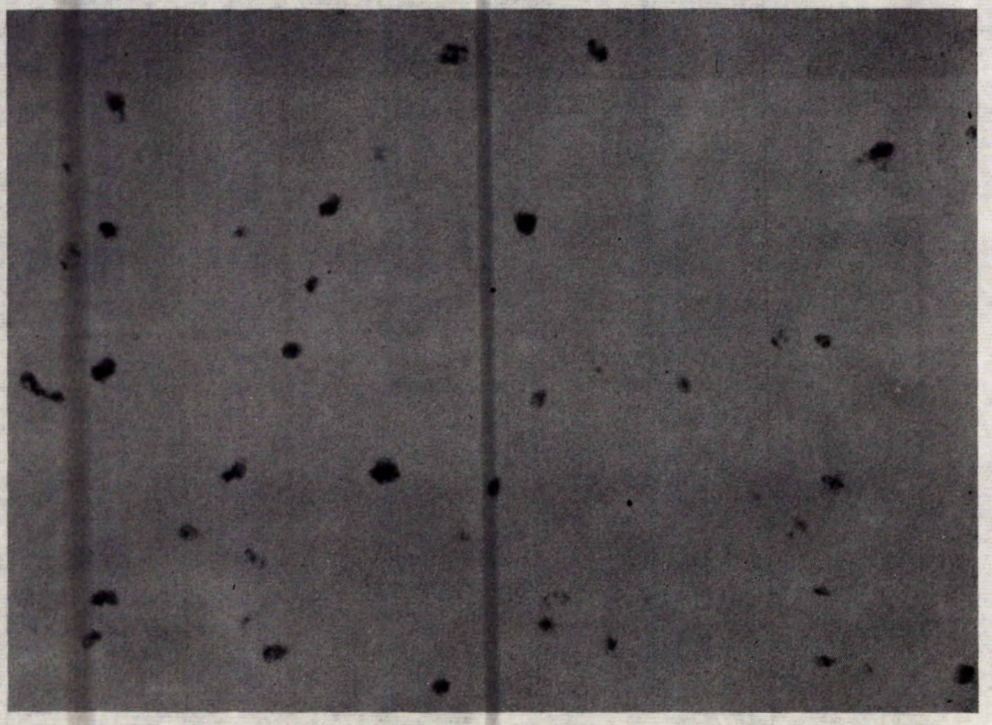

Figure 14. Polarizers Crossed X1000.

The photomicrographs of Figures 9 to 14 were obtained by Mr. D.R. Bell of the Physical Metallurgy Division, who reports:

"It appears that the photographs obtained from the QTM viewer show both a second phase and voids. The voids have apparently been formed by dislodgement of some of the second phase particles from the surface of the sample. The second phase is not entirely opaque".

The images Figures 13 and 14, obtained with polarizers crossed apparently show the voids due to dislodgement, noted above. These voids were probably formed during preparation of the polished sections.

ACKNOWLEDGEMENT

The author wishes to thank the Mineralogy Section of the Mineral Processing Division for preparation of the polished sections. Particular thanks are due to Mr. D.R. Bell, Physical Metallurgy Division for operation of the QTM and interpretation of the photographs and for his advice during discussions of this project.

AAW/lm