INCREMENTAL CHANGE Release Notification Date: 08/25/2023

SPM 70-33-08 REPLICATION TO IDENTIFY EVIDENCE OF FOREIGN MATERIAL AFTER BLENDING

DISCLAIMER

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GE Designated: -CONFIDENTIAL-

HIGHLIGHTS

HIGHLIGHT REFERENCE	DESCRIPTION OF CHANGE
tk70-33-08-220-000	Technical Change: Added new inspection method to evaluate the surfaces after blending.

TASK 70-33-08-220-000

1. General.

Subtask 70-33-08-220-010

A. This procedure gives instructions for evaluation of surfaces to make sure that the defect (local pit or deposited material) was fully removed, with no evidence of foreign material after blending. This procedure is applicable for R88DT, R104, R65, and Inco 718 materials.

B. This procedure has two separate inspection methods: Method 1 - Magnified Visual Inspection and Method 2 - Microstructure Evaluation by Replication which are for specified conditions as described below. Refer to Subtask 70-33-08-220-011, General - Method 1 - Magnified Visual Inspection and Subtask 70-33-08-220-012, General - Method 2 - Microstructure Evaluation by Replica for applicability details.

NOTE: If the instructions referencing this procedure require replica after localized pitting removal and no specific method is referenced (Method 1 or Method 2), Method 1 can be used as an acceptable alternative to Method 2, if the conditions given in Subtask 70-33-08-220-011, General - Method 1 - Magnified Visual Inspection (paragraph 2.A.) are met.

C. This procedure is required to be applied at each location of localized pitting or deposited material.

2. General - Method 1 - Magnified Visual Inspection.

Subtask 70-33-08-220-011

A. Method 1 is only applicable to localized pitting and must be used for evaluation of foreign material only when the following criteria are satisfied:

(1) Pit depth prior to blend measures less than or equal to 0.002 inch (0.050 mm).

(2) Groups of pitting must be contained within an area less than or equal to 0.002 sq. in. (1.290 sq. mm). Refer to Figure 2.

(3) Spacing between groups of pits measures greater than 0.100 inch (2.54 mm).

NOTE: If any of these criteria are not satisfied, do Subtask 70-33-08-220-012, Method 2 - Microstructure Evaluation by Replication.

3. Equipment.

Subtask 70-33-08-220-001

A. The following equipment is necessary for the procedure:

(1) Magnification equipment 10X (Commercial).

(2) White Light Source (White light lamp for visual inspection of parts). The lamp must be capable of providing a minimum of 100 ft-candles of white light at the inspection surface.

4. Materials.

Subtask 70-33-08-220-003

Consumable Product - Table 1	No.
Solvent, General (isopropyl alcohol)	C04-035
Solvent, General (acetone)	C04-003

5. Procedure.

Subtask 70-33-08-350-001

CAUTION: BLENDING BEYOND THE INCOMING PITTING DEPTH IS NECESSARY FOR FULL PIT REMOVAL WHILE STILL BEING WITHIN APPROVED BLENDING DEPTH LIMIT IN THE INSTRUCTIONS REFERENCING THIS PROCEDURE.

A. Blend localized pitting in accordance with the instructions referencing this procedure to fully remove it.

Subtask 70-33-08-350-002

B. Polish the inspection area to achieve a good surface finish which is free of any contamination, scratches, or surface discontinuities. Refer to Figure 1.

NOTE: Use different grades of abrasive paper as necessary (gradually getting finer) until the surface is sufficiently prepared to perform a visual inspection. Refer to Figure 1.

Subtask 70-33-08-110-001

C. Clean the blended area with isopropyl alcohol C04-035 or acetone C04-003 to prepare the area for visual inspection.

Subtask 70-33-08-220-004

D. Visually inspect the blended areas using x10 magnification with white light for no evidence of remaining pitting, foreign material, discoloration, or any other surface anomalies. Refer to Figure 1 (Sheet 4).

6. Quality Assurance.

Subtask 70-33-08-220-005

A. The following conditions must be met for quality assurance:

(1) No evidence of remaining pitting, foreign material, discoloration, or any other surface anomalies is permitted when visually inspected using x10 magnification with white light. Refer to Figure 1 (Sheet 4).

(2) If there is no visual evidence of remaining pitting, foreign material, discoloration, or any other surface anomalies, then the blend zone is free of any foreign material.

(3) If necessary, do rework by light polishing to improve inspection readability for better visual surface finish and texture, and re-inspect. Repeat Subtask 70-33-08-220-011, General - Method 1 - Magnified Visual Inspection (paragraph 5.B. thru paragraph 6.A.(2)).

CAUTION: IF RE-BLENDING IN ACCORDANCE WITH SUBTASK 70-33-08-220-011, GENERAL - METHOD 1 - MAGNIFIED VISUAL INSPECTION (PARAGRAPH 6.A.(4)) IS NECESSARY, THEN METHOD 1 MUST NOT BE USED. METHOD 2 MUST BE FOLLOWED FOR INSPECTION.

(4) If remaining pitting, foreign material, discoloration, or any other surface anomalies is present, refer to the instructions referencing this procedure for blending to remove more material with the maximum blend depth allowance and then continue with Subtask 70-33-08-220-012, Method 2 - Microstructure Evaluation by Replica (paragraph 10.B.) to evaluate the microstructure.

7. General - Method 2 - Microstructure Evaluation by Replica.

Subtask 70-33-08-220-012

A. This procedure gives instructions for the preparation, replication, and evaluation of surfaces to make sure there is no evidence of foreign material after blending for R88DT, R104, R65, and Inco 718 materials.

B. This procedure requires suitably trained personnel. Verification shall be determined by replicating and correctly evaluating the results against photo standards.

NOTE: If the instructions referencing this procedure require replica after localized pitting removal and no specific method is referenced (Method 1 or Method 2), Method 1 can be used as an acceptable alternative to Method 2, if the conditions given in SUBSTASK 70-33-08-220-011, General - Method 1 - Magnified Visual Inspection (paragraph 2.A.) are met.

C. Deleted.

8. Equipment.

Subtask 70-33-08-220-006

A. Tools and Equipment

(1) Special Tools

Description
Microscope with measuring capability at 100X to 500X Glass slide

B. Standard Tools and Equipment

Description

Scissors
High precision tweezers*
Nonabrasive cloth

NOTE: *High precision tweezers can be obtained from TED PELLA, INC. Product code #5622 (SS 110mm).

9. Materials.

Subtask 70-33-08-220-008

Consumable Product - Table 2	No.
Solvent, General (isopropyl alcohol)	C04-035
Solvent, General (acetone)	C04-003
Thick Replicating Tape, 125m	C10-254
Abrasive Paper (6 micron diamond paste or finer abrasive)	C10-255
Hydrochloric Acid	C04-071
Solvent, General (94-96% assay ethanol)	C04-228
Cupric Chloride Dihydrate	C04-302
Alcohol, Methyl	C04-180

10. Procedure.

Subtask 70-33-08-160-015

WARNING: REFER TO THE PRODUCT LABEL AND THE MANUFACTURER'S (MATERIAL) SAFETY DATA SHEET (SDS) FOR INSTRUCTIONS ON THE HAZARDS, STORAGE, SAFE HANDLING AND PROPER USE OF CONSUMABLE PRODUCTS.

A. Clean with isopropyl alcohol C04-035 or acetone C04-003 to prepare the area for polishing. Make sure that the surface is free of any contamination (for example grit and oil).

Subtask 70-33-08-120-033

B. Remove all machining marks by sanding, using successively finer abrasives. The final polish shall be performed with abrasive paper C10-255.

NOTE: For best replica results, alternate the polishing direction as finer abrasive papers are applied to the area. This will help avoid evidence scratches on the replica.

Subtask 70-33-08-110-537

C. Clean the polished areas with isopropyl alcohol C04-035 or acetone C04-003 and a suitable nonabrasive cloth. Make sure that the surface is free of any contamination (for example grit and oil).

Subtask 70-33-08-110-002

D. Prepare the Kallings Etchant Solution in accordance with Table 3.

NOTE: Larger or smaller quantities may be mixed, as desired, as long as proportions are equal to those given.

Kallings Etchant Ingredients - Table 3

C04-302	Cupric Chloride Dihydrate	2 gr
C04-071	Hydrochloric Acid	40 mL
C04-228 or C04-180	Ethanol or Methyl Alcohol	40-80 mL

Subtask 70-33-08-110-538

CAUTION: MAKE SURE TO DO A CHECK OF THE ENVIRONMENT REGULATIONS BEFORE DISCARDING SOLUTIONS.

E. Etch the polished area(s) in preparation for the surface microstructure examination refer to TASK 70-24-01-110-034, Swab Etching Procedure for details on the application process requirements (localized and careful application).

(1) Etch the polished area(s) for 60-90 seconds.

NOTE: Pay attention to any dark discoloration in the etched surface (this is a signal that the etchant has been applied too long or there is still evidence of foreign material).

NOTE: If you need to repeat the etching process, do not pass the total time of 180 seconds.

Subtask 70-33-08-110-003

WARNING: THE ACTIVE INGREDIENTS OF ETCHANTS ARE TOXIC AND CORROSIVE. USE IN A WELL VENTILATED AREA, WEAR PROTECTIVE CLOTHING, GLOVES AND FACE SHIELD. AVOID PROLONGED BREATHING OF VAPORS AND CONTACT WITH THE SKIN. IF ETCHING SOLUTION GETS INTO EYES, FLUSH THOROUGHLY WITH COOL WATER UNDER EYELIDS, AND OBTAIN MEDICAL ATTENTION AT ONCE.

WARNING: REFER TO THE PRODUCT LABEL AND THE MANUFACTURER'S (MATERIAL) SAFETY DATA SHEET (SDS) FOR INSTRUCTIONS ON THE HAZARDS, STORAGE, SAFE HANDLING AND PROPER USE OF CONSUMABLE PRODUCTS.

CAUTION: DO NOT POUR WORKING SOLUTION BACK INTO STOCK CONTAINER. DISPOSE OF THE USED WORKING SOLUTION IN ACCORDANCE WITH LOCAL ENVIRONMENTAL, HEALTH, AND SAFETY REGULATIONS.

F. Wash off the polished area(s) with isopropyl alcohol C04-035 or acetone C04-003.

NOTE: Make sure that all evidence of the etchant solution is all removed.

Subtask 70-33-08-220-009

G. Perform a microstructure replication of all of the etched area(s), as follows:

(1) Cut a piece of replicating tape larger than the area to be replicated.

(2) Wet the surface of the part to be replicated, or one side of the replicating tape with acetone C04-003 or other approved solvent.

(3) Place replicating tape on the area to be replicated and allow to dry. The typical drying time for a 0.005 inch (0.13 mm) tape wet with acetone is about 10 minutes.

(4) Use a high precision tweezers lift one corner of the replicating tape and remove tape.

(5) Place the replica tape on a clean glass slide, with the replicated face not in contact with the glass.

(6) Put a mark on the replica slide, the location of the area examined, and the serial number of the part.

11. Quality Assurance.

Subtask 70-33-08-220-132

A. Perform an evaluation of the replica(s), as follows:

(1) Use a microscope and examine replica(s) at 100X, at 200X or at 500X magnification. When applicable, higher magnification may be used.

(2) Evaluate the replica(s) for conformance. Refer to Figure 3 for photo standard examples of acceptable replicas.

(3) Refer to Figure 4 for typical replica defects that are not indicative of foreign material. If these defects are excessive (i.e., they cover more than 1/4 of the replica area and obscure the normal grain boundary structure of the material) the replica must be made again, or contact GE Engineering for further assessment.

NOTE: An acceptable replica will show the normal grain boundary structure of the material.

NOTE: This step should only be performed by trained personnel in the field of material grain boundary microscopy.

(4) If there is no evidence of any foreign material present, the assessment is acceptable. Refer to Figure 5 for evidence of an irregular (unacceptable) grain structure and foreign material.

NOTE: No grain boundaries or large areas of no grain boundaries shows foreign material is present.

NOTE: Any suspect evidence of foreign material must be sent to GE Engineering for further assessment. Please include the details that follow: part number and serial number, customer/operator, time since new, cycles since new, time since overhaul, and cycles since overhaul. This information can be submitted as a Service Request (SR) via myGEAviation.com. Alternatively, send photos of replica with a scale bar included for the magnification used, to Support at Aviation.Fleetsupport@ge.com.

Subtask 70-33-08-120-034

B. Polish the etched area(s) to remove the effects of etching, as follows:

(1) Polish with abrasive cloth C10-010. Make sure a surface finish equal to, or better than the adjacent area is achieved.

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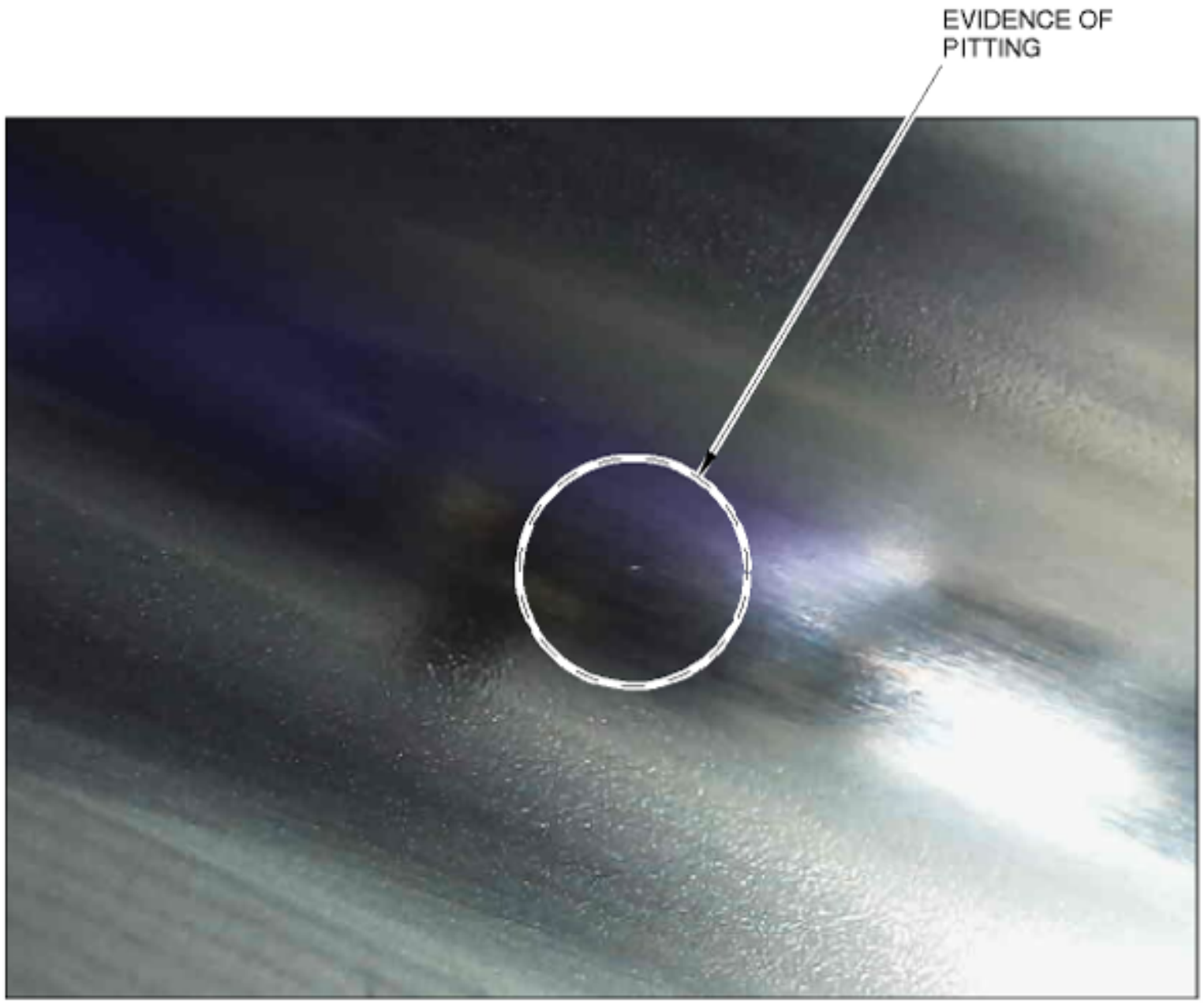

6042110-00

Figure 1 (Sheet 1) Blended Surface with Evidence of Pitting Remaining - Not Acceptable for Visual Evaluation

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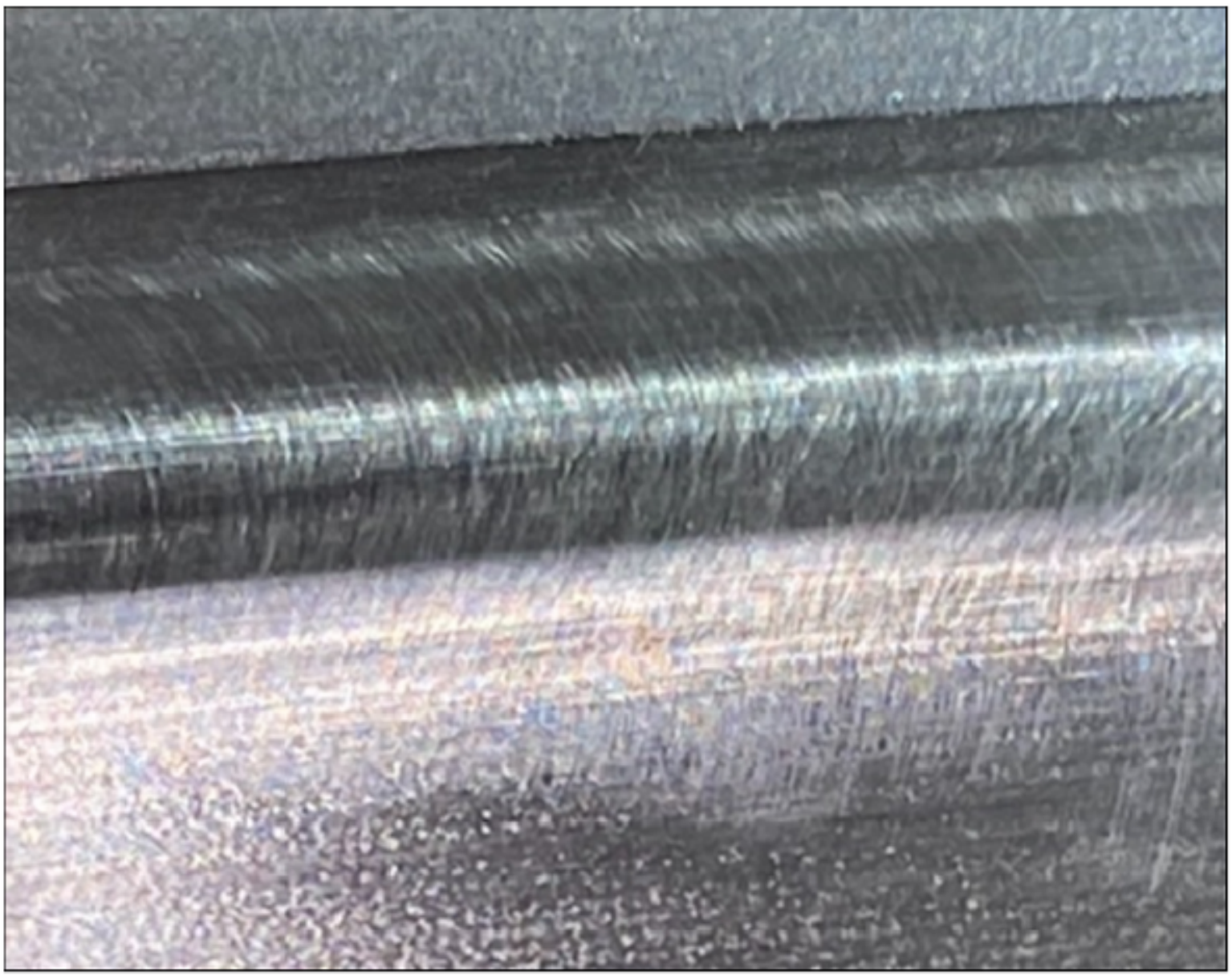

6042111-00

Figure 1 (Sheet 2) Evidence of Scratches in the Blend Zone - Not Acceptable for Visual Evaluation

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6042112-00

Figure 1 (Sheet 3) Evidence of Wheel Burning Caused During the Blending - Not Acceptable for Visual Evaluation

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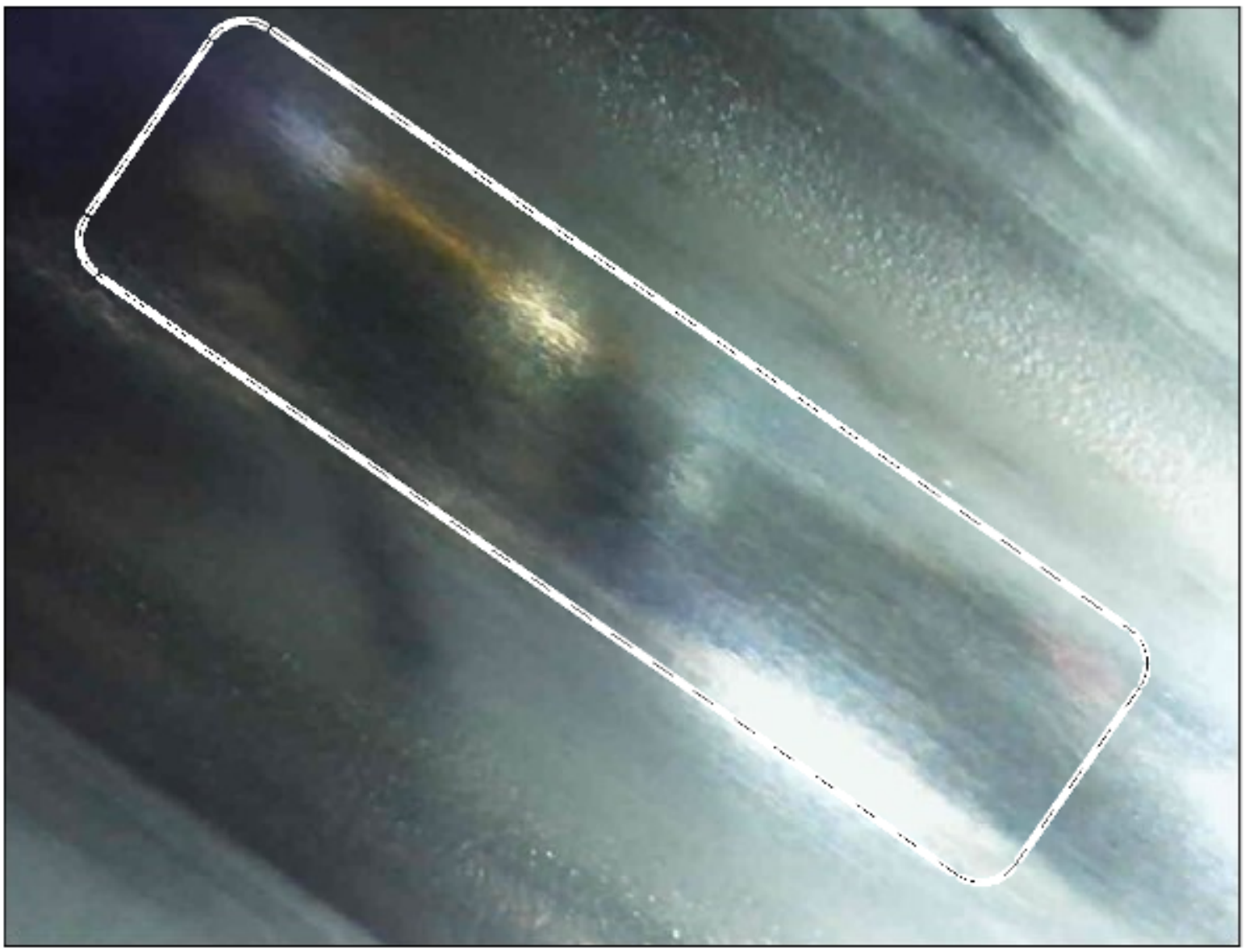

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Figure 1 (Sheet 4) Example of a Blended Surface Free of Any Pits, Scratches or Surface Anomalies - Acceptable for Visual Evaluation

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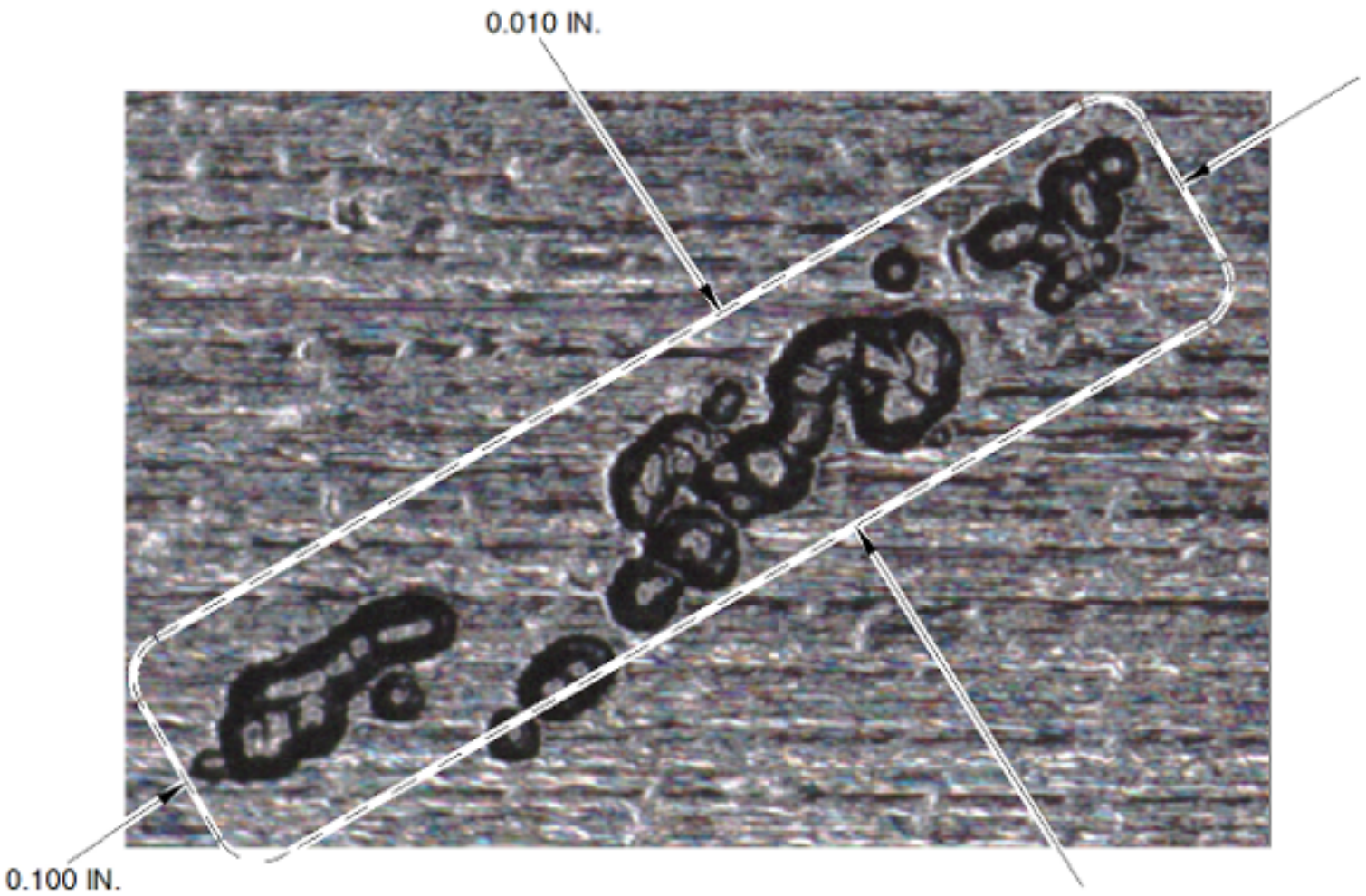

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Figure 2 Example of a "Group" Containing Coalesce and Isolated Pits Measuring 0.001 Sq. In.

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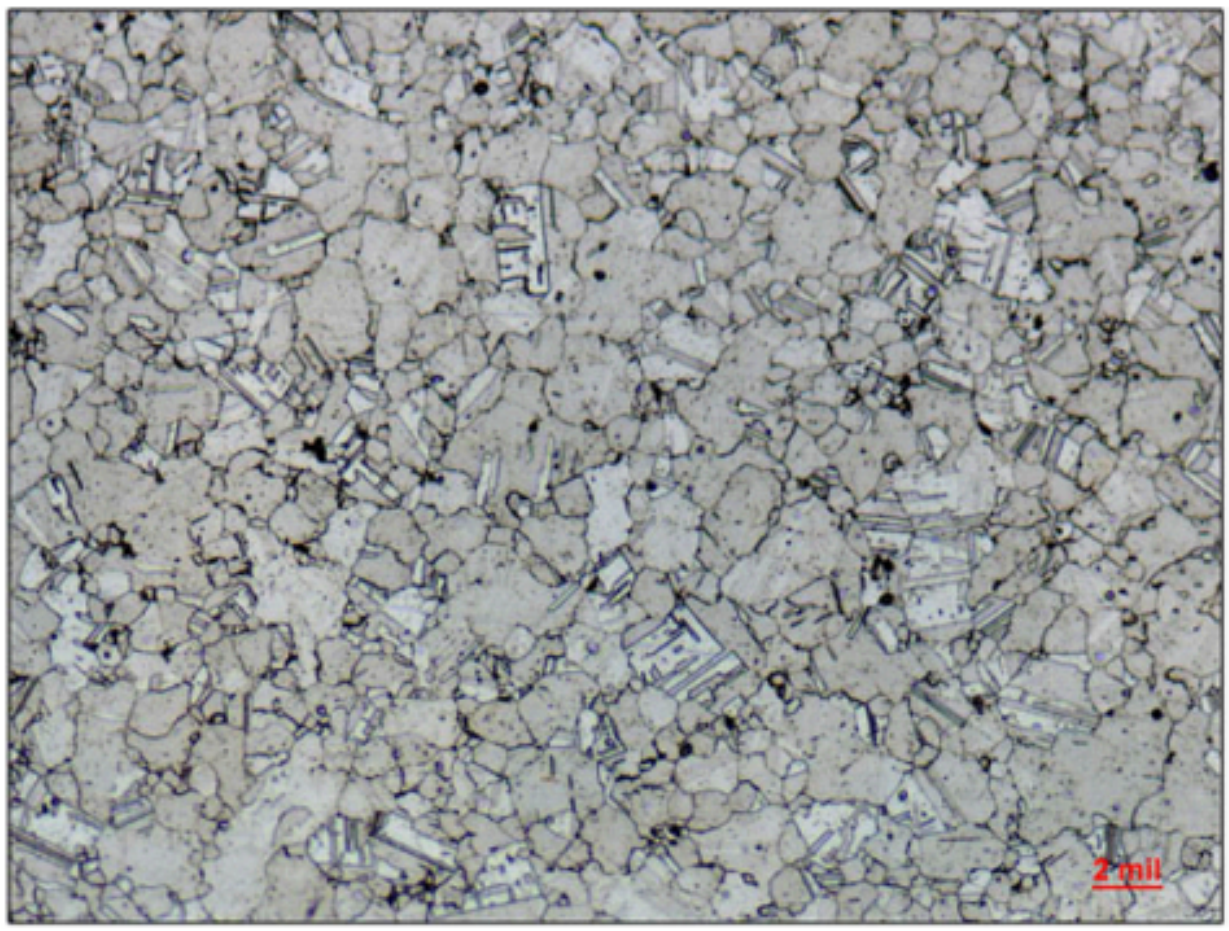

NORMAL RENE´88DT
100X MAGNIFICATION

6002881-00

Figure 3 (Sheet 1) Normal Grain Structure from Replication.

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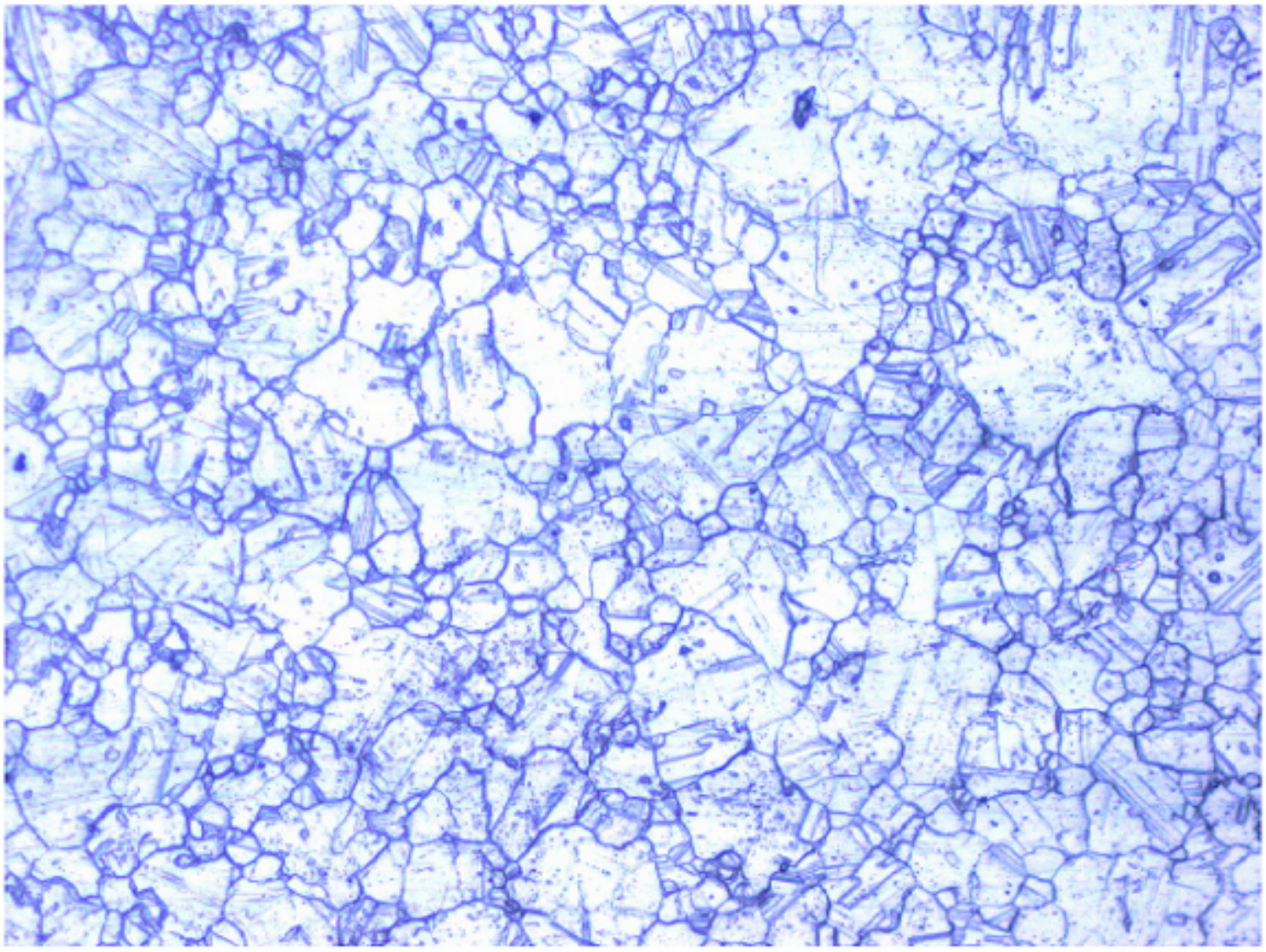

NORMAL RENE 88DT
200X

6038597-00

Figure 3 (Sheet 2) Normal Grain Structure from Replication

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NORMAL RENE´65
100X MAGNIFICATION

6002880-00

Figure 3 (Sheet 3) Normal Grain Structure from Replication

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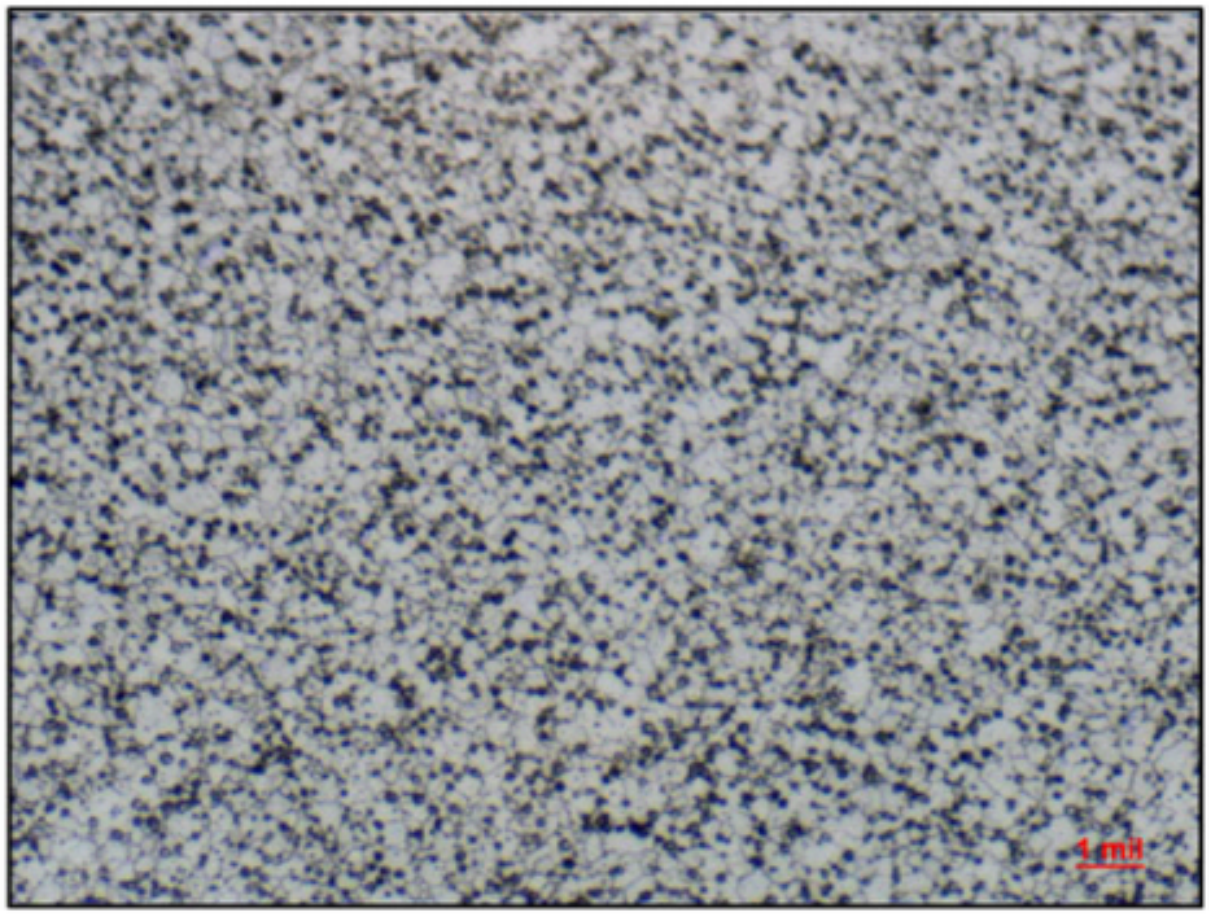

NORMAL RENE´65
200X MAGNIFICATION

6002822-00

Figure 3 (Sheet 4) Normal Grain Structure from Replication

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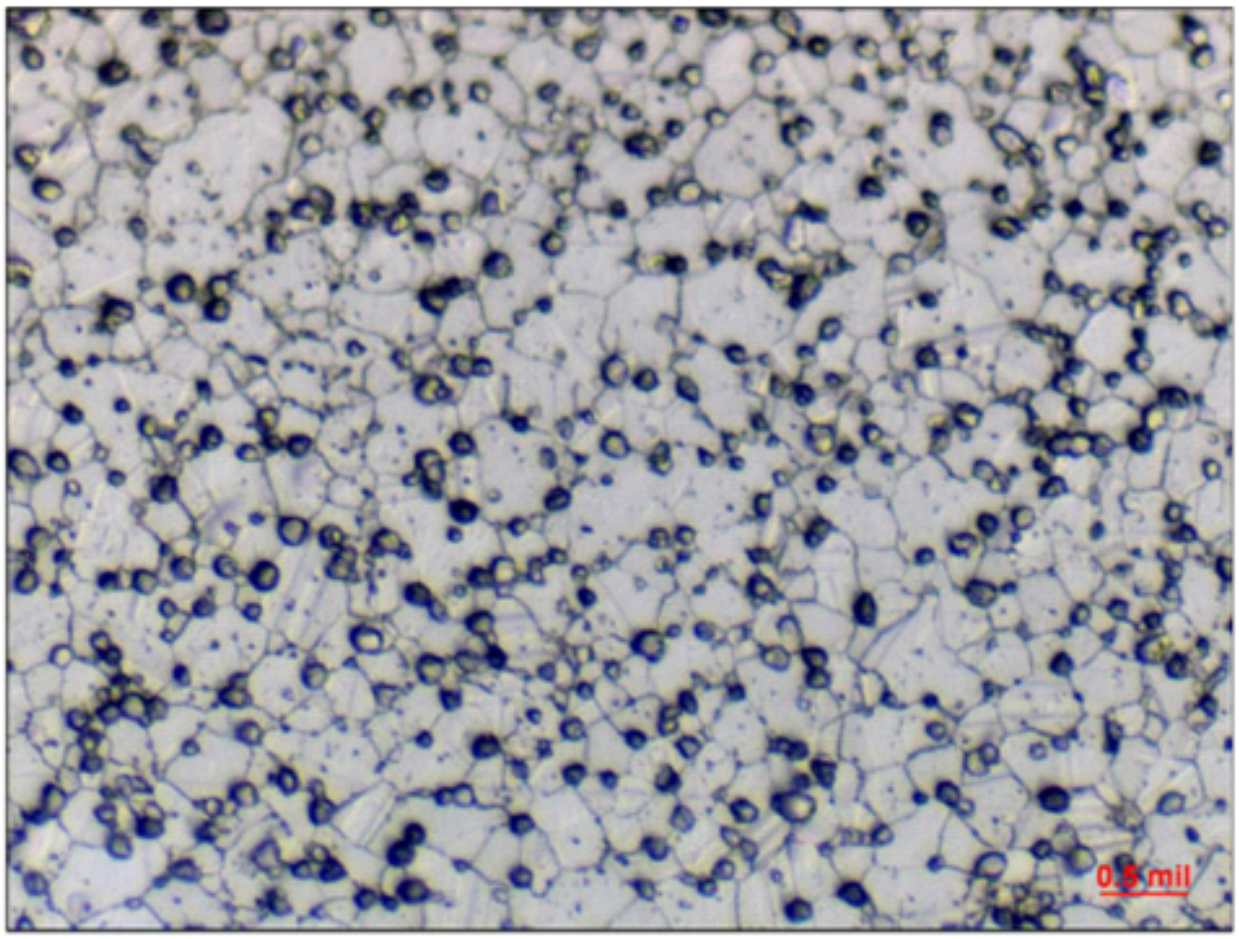

NORMAL RENE´65
500X MAGNIFICATION

6002821-00

Figure 3 (Sheet 5) Normal Grain Structure from Replication

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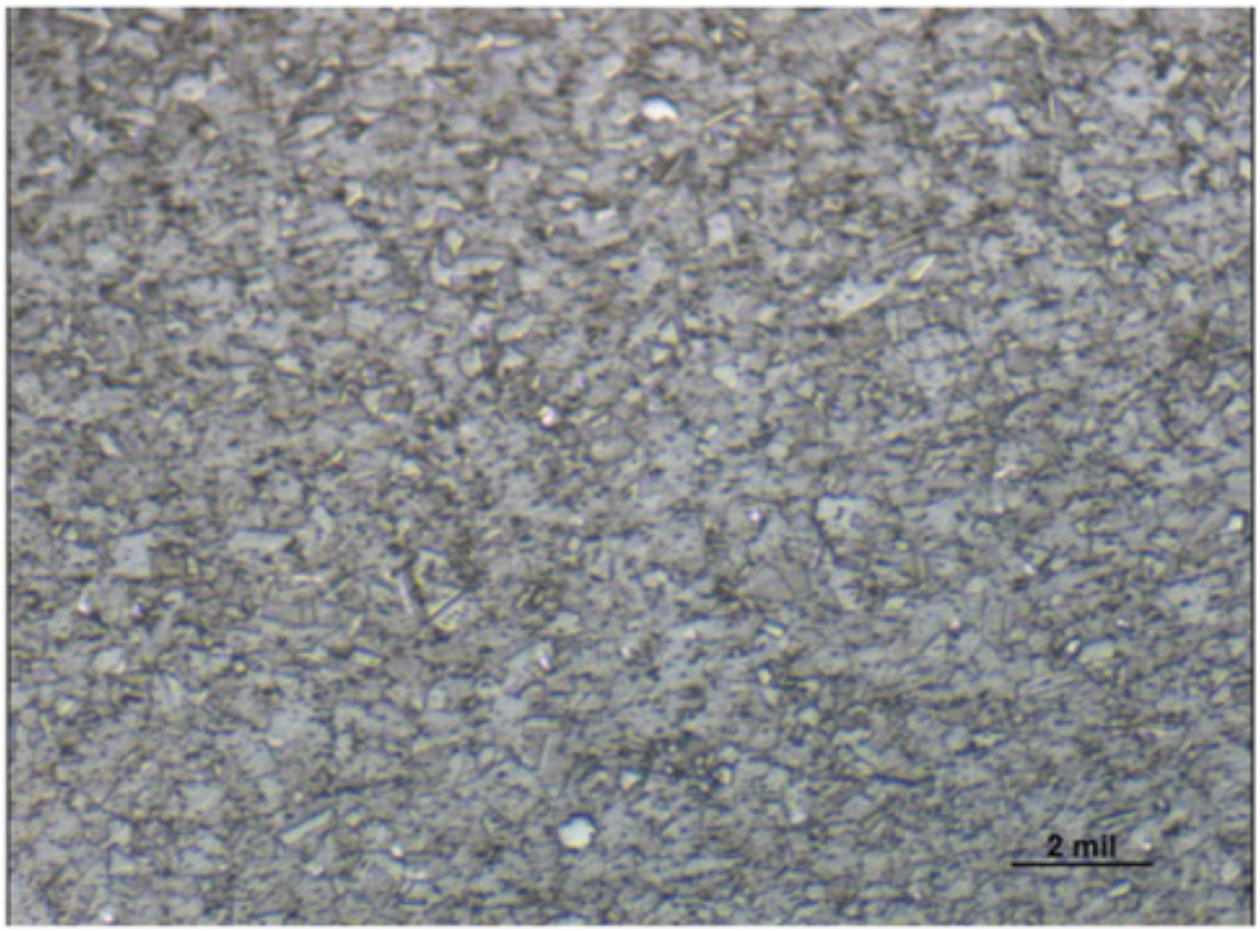

NORMAL DA718
200X MAGNIFICATION

6002820-00

Figure 3 (Sheet 6) Normal Grain Structure from Replication

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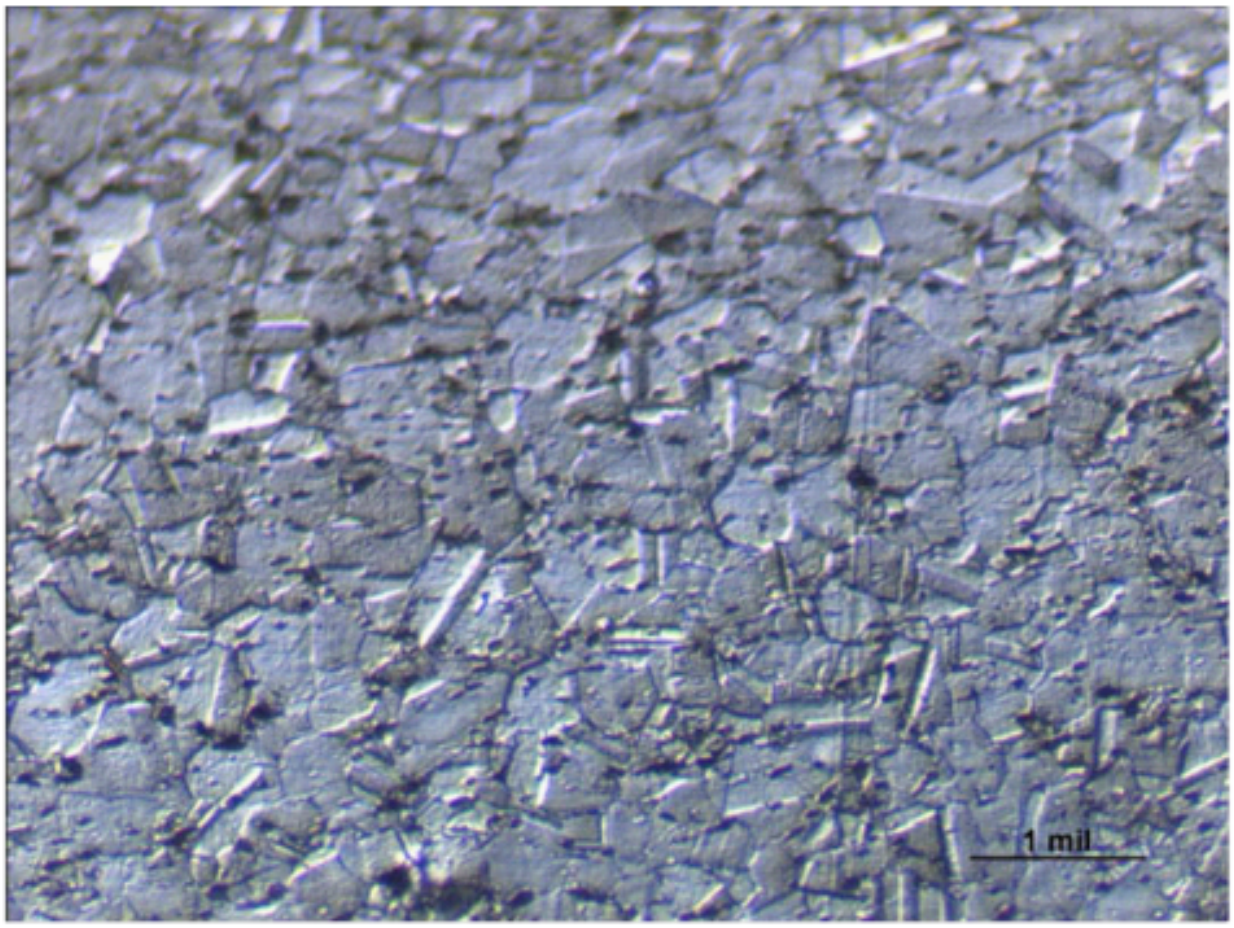

NORMAL DA718
500X MAGNIFICATION

6002819-00

Figure 3 (Sheet 7) Normal Grain Structure from Replication

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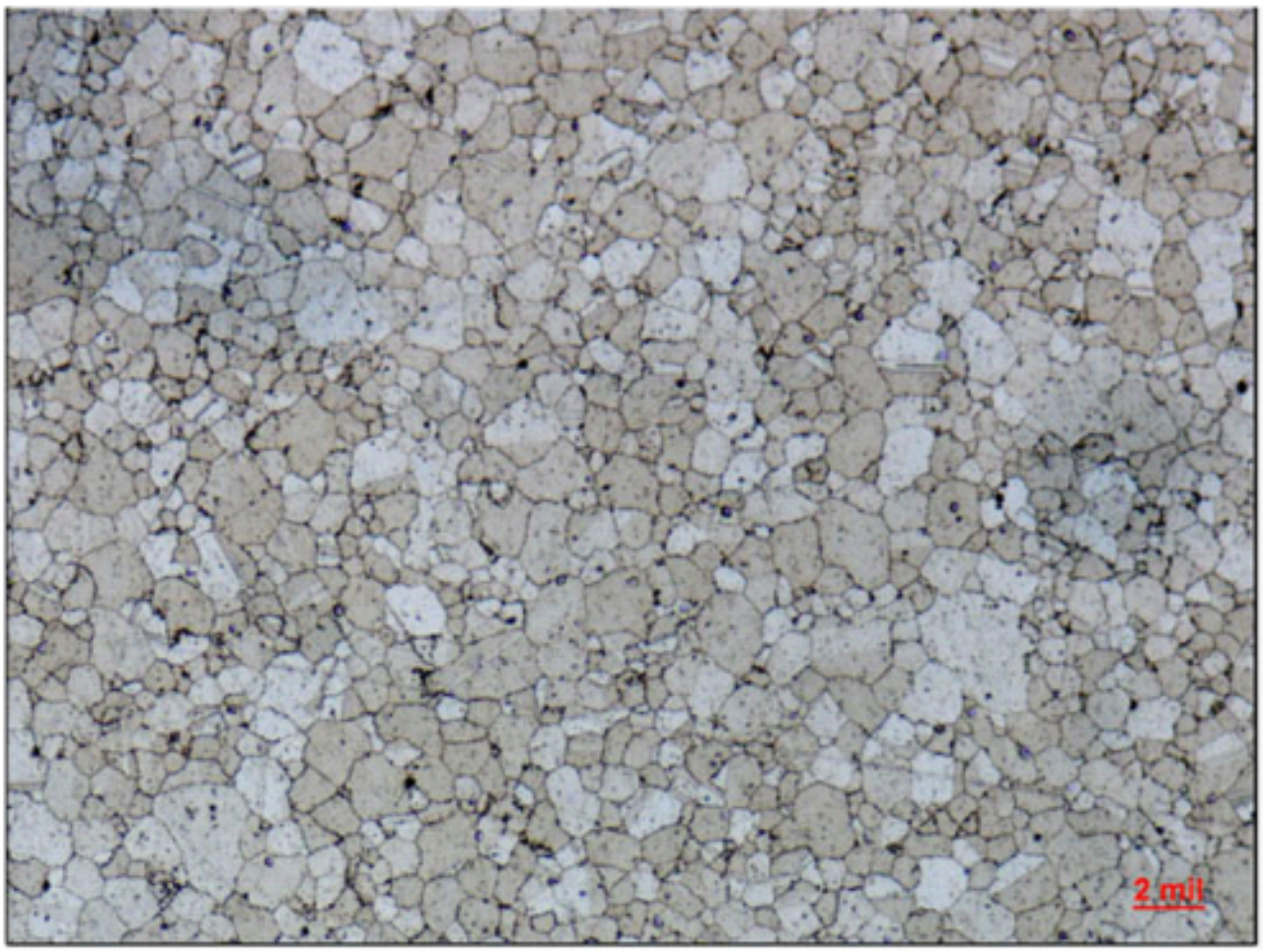

NORMAL RENE´ 104
100X MAGNIFICATION

6002818-00

Figure 3 (Sheet 8) Normal Grain Structure from Replication

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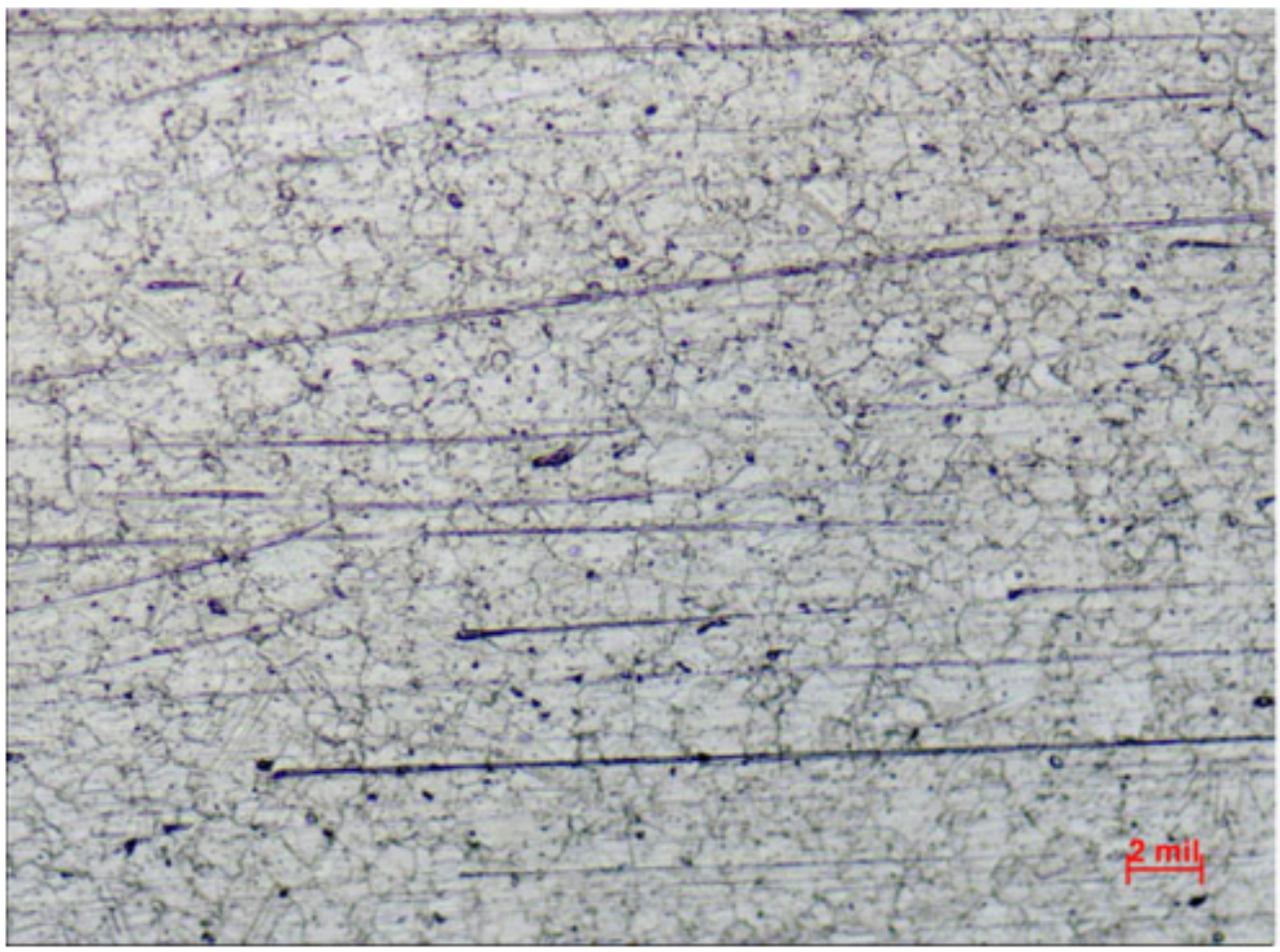

SCRATCHES

6002817-00

Figure 4 (Sheet 1) Grain Structure from Replication Rene'88DT with Scratches.

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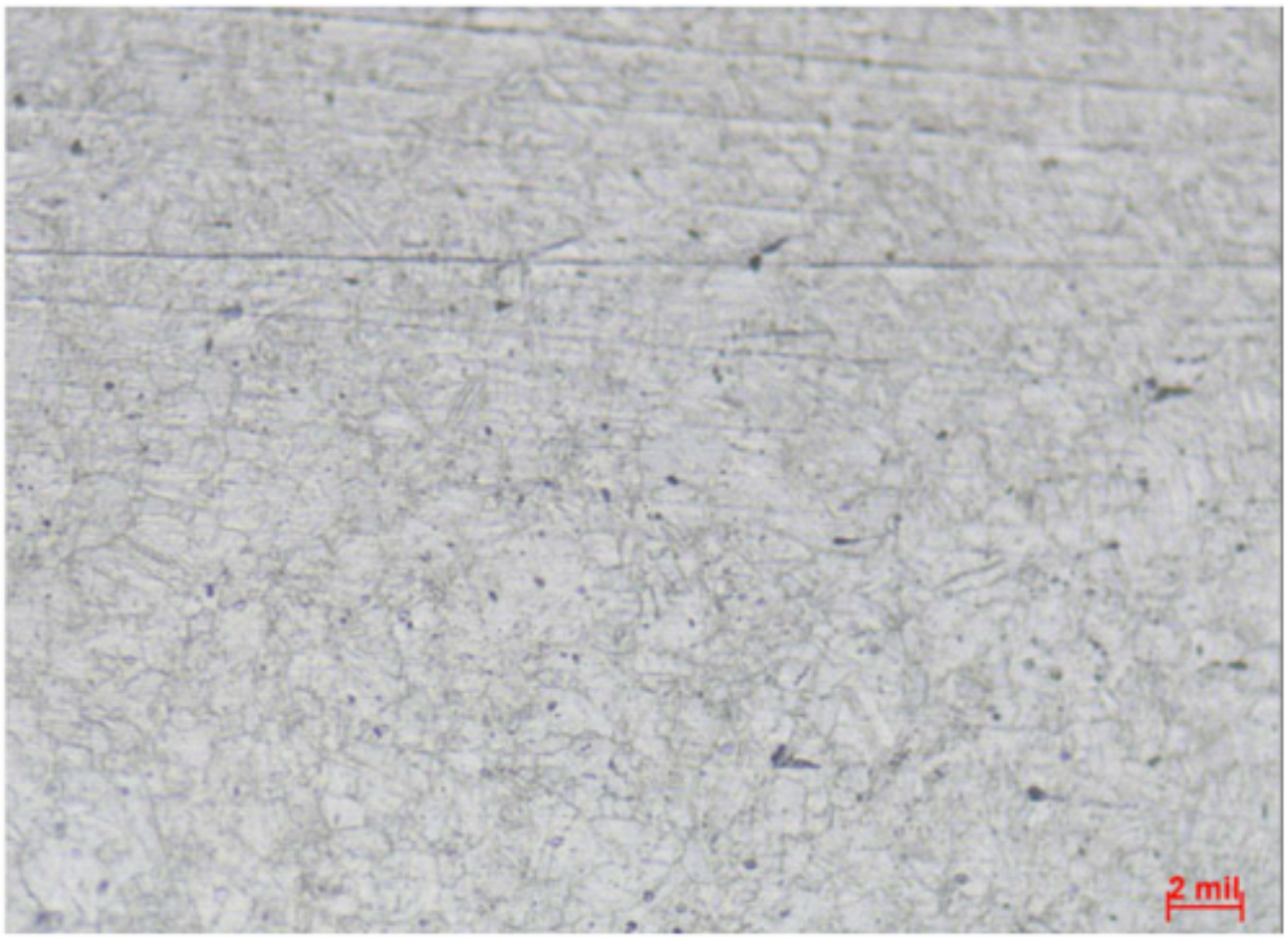

UNDER ETCHED

6002816-00

Figure 4 (Sheet 2) Grain Structure from Replication Rene'88DT Under Etched.

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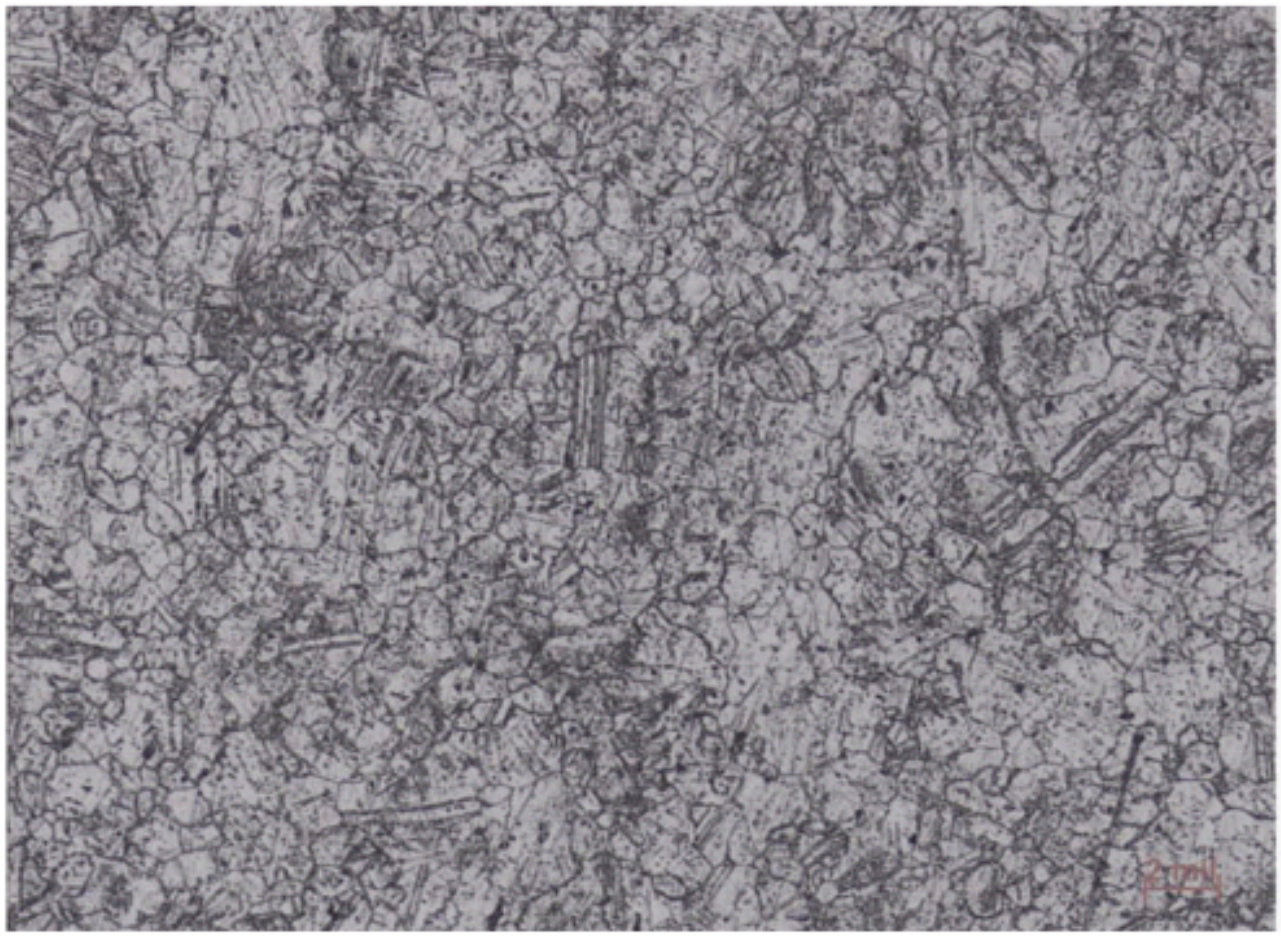

OVER ETCHED

6002814-00

Figure 4 (Sheet 3) Grain Structure from Replication Rene'88DT Over Etched.

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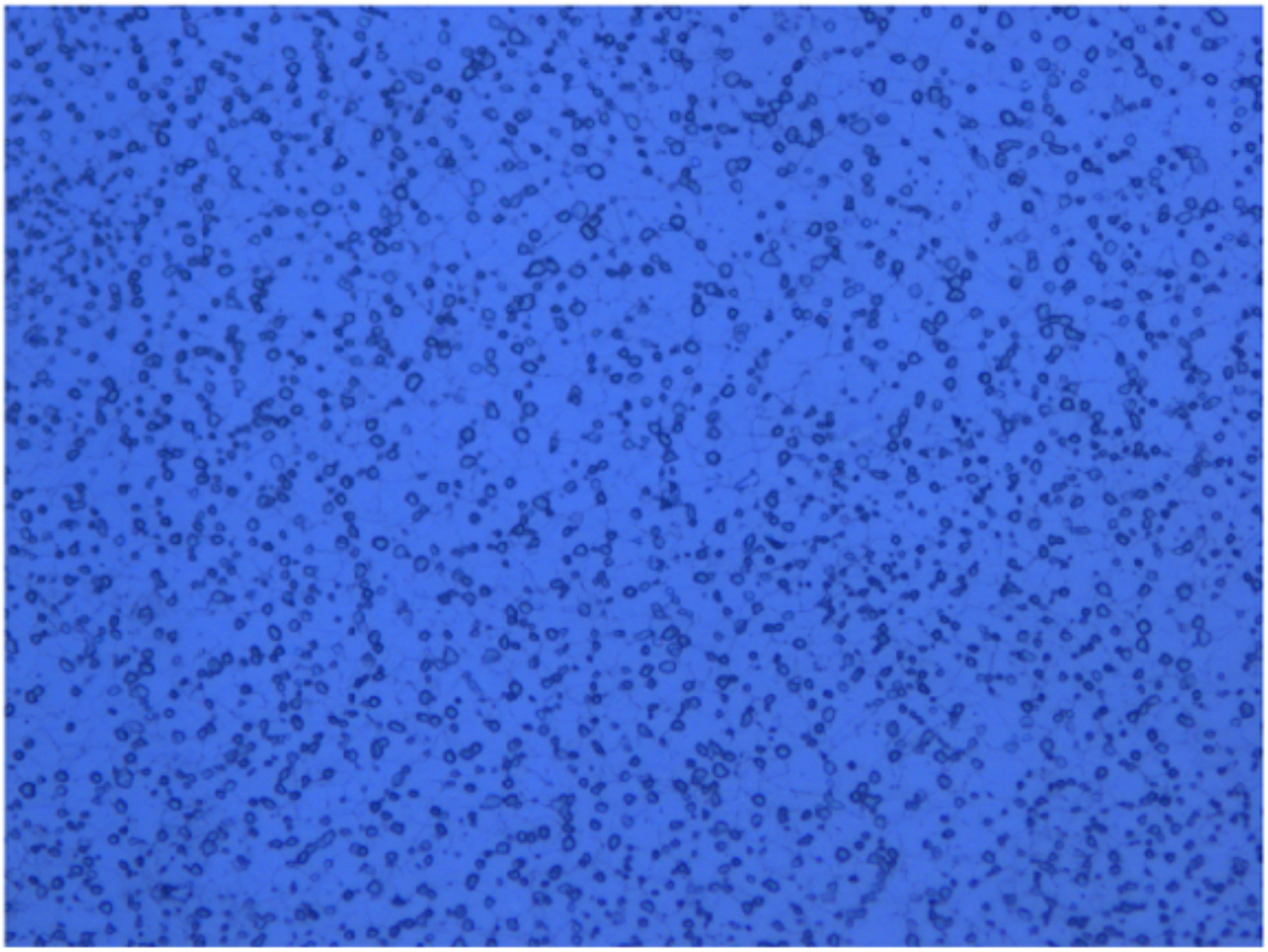

Figure 4 (Sheet 4) Grain Structure from Replication Rene'65 Under Etched

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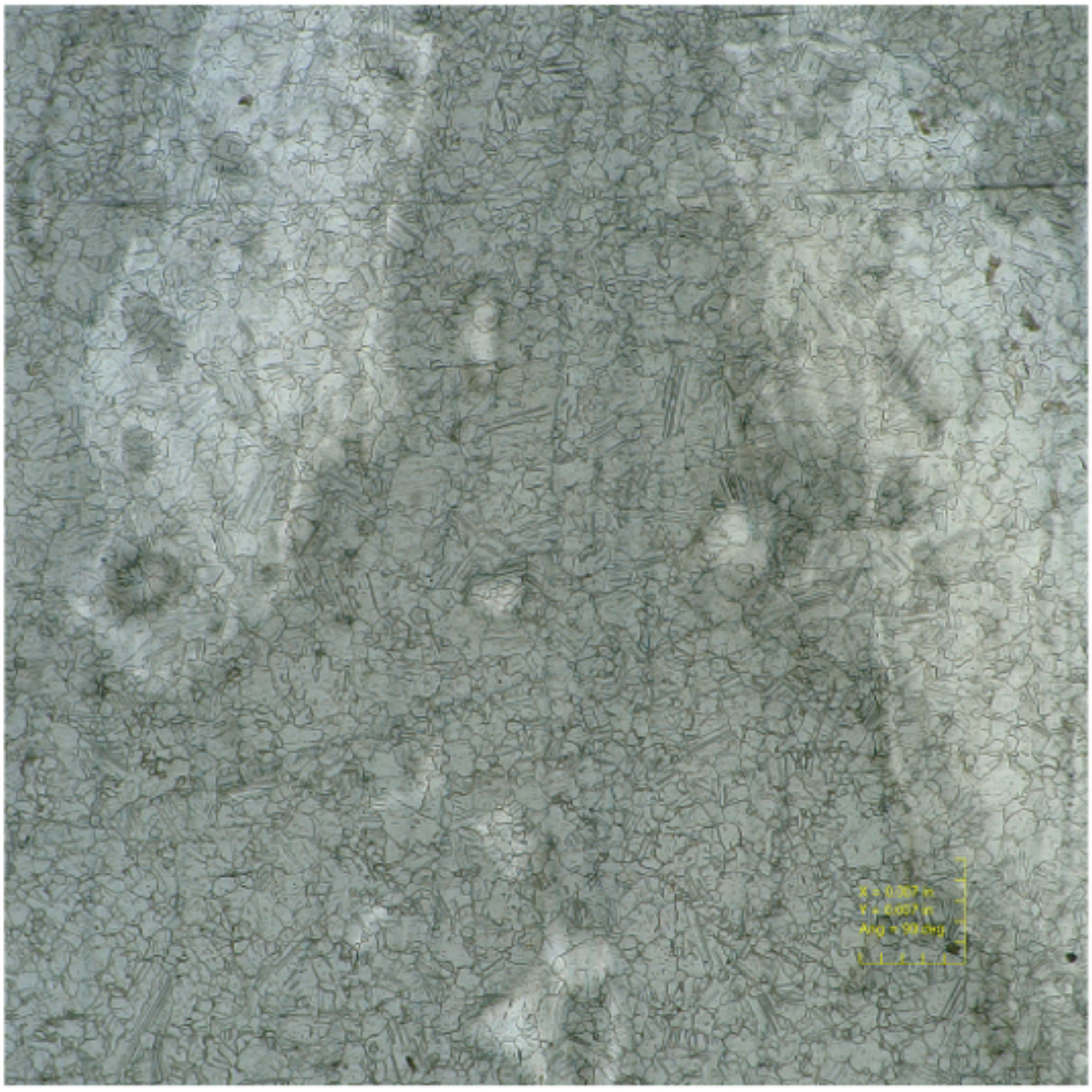

BUBBLE REPLICA DEFECT
RENE 88DT
100X

6038599-00

Figure 4 (Sheet 5) Replica with Region of Replica Tape that is Inadequately Adhered, that Produces a Bubbled Area

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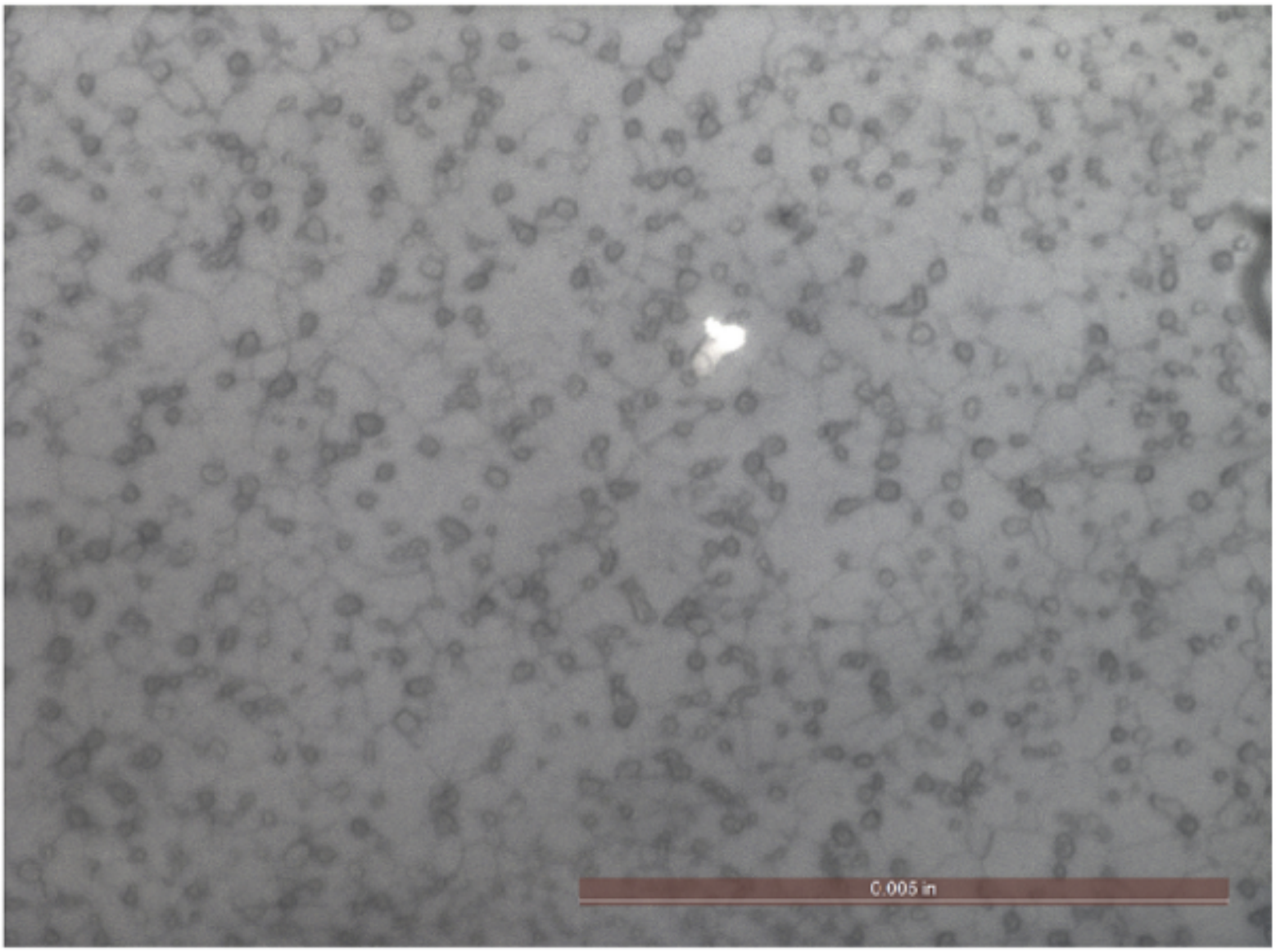

BRIGHT SPOT REPLICA DEFECT FROM DEBRIS
RENE 65
500X

6038600-00

Figure 4 (Sheet 6) Replica with Bright Spot due to Debris on the Surface Underneath the Replica Tape

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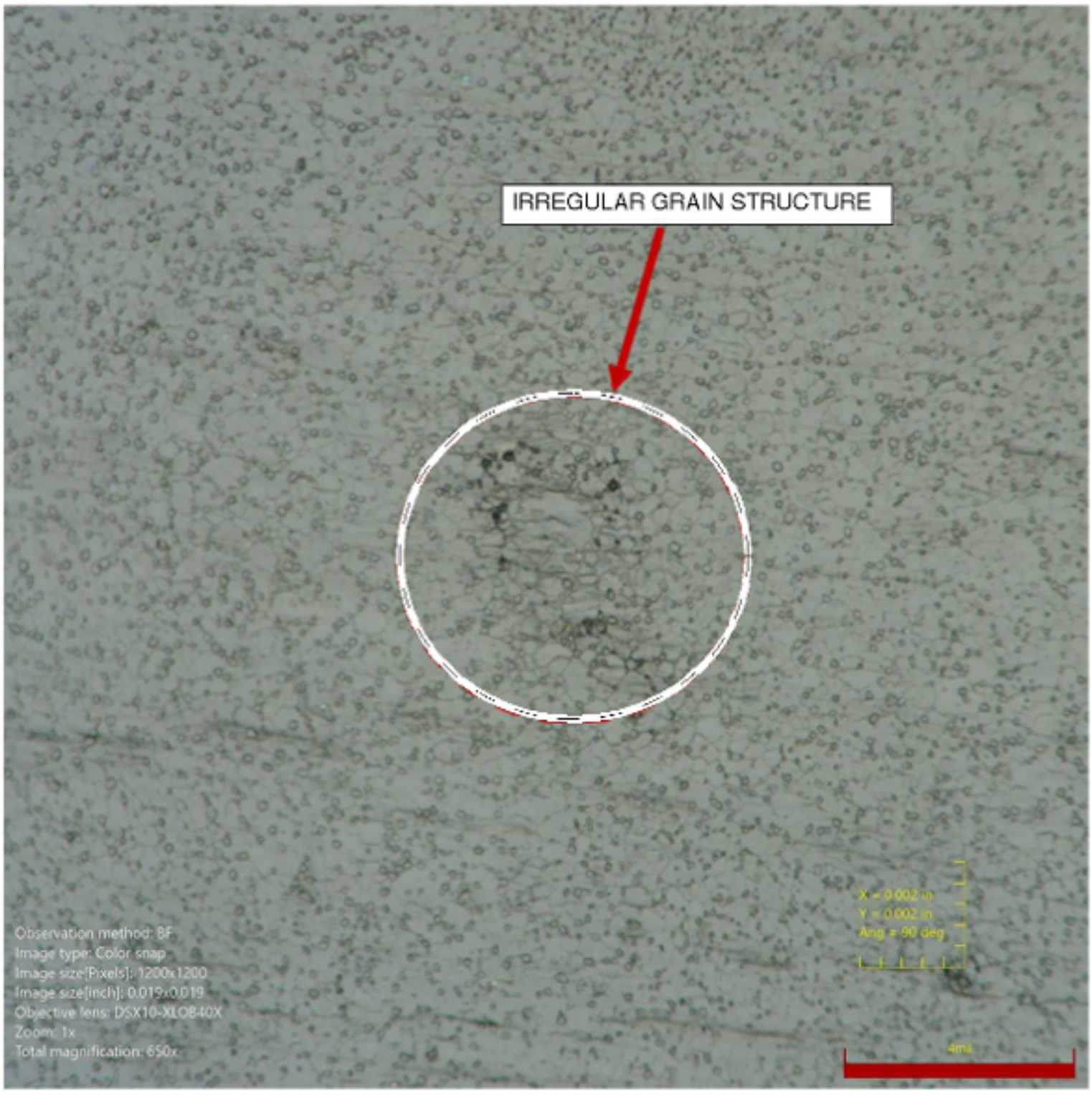

IRREGULAR GRAIN STRUCTURE, RENE 65, 650x

6042115-00

Figure 5 (Sheet 1) Unacceptable Grain Structure from Replication of Rene 65 - Evidence of an Irregular Grain Structure

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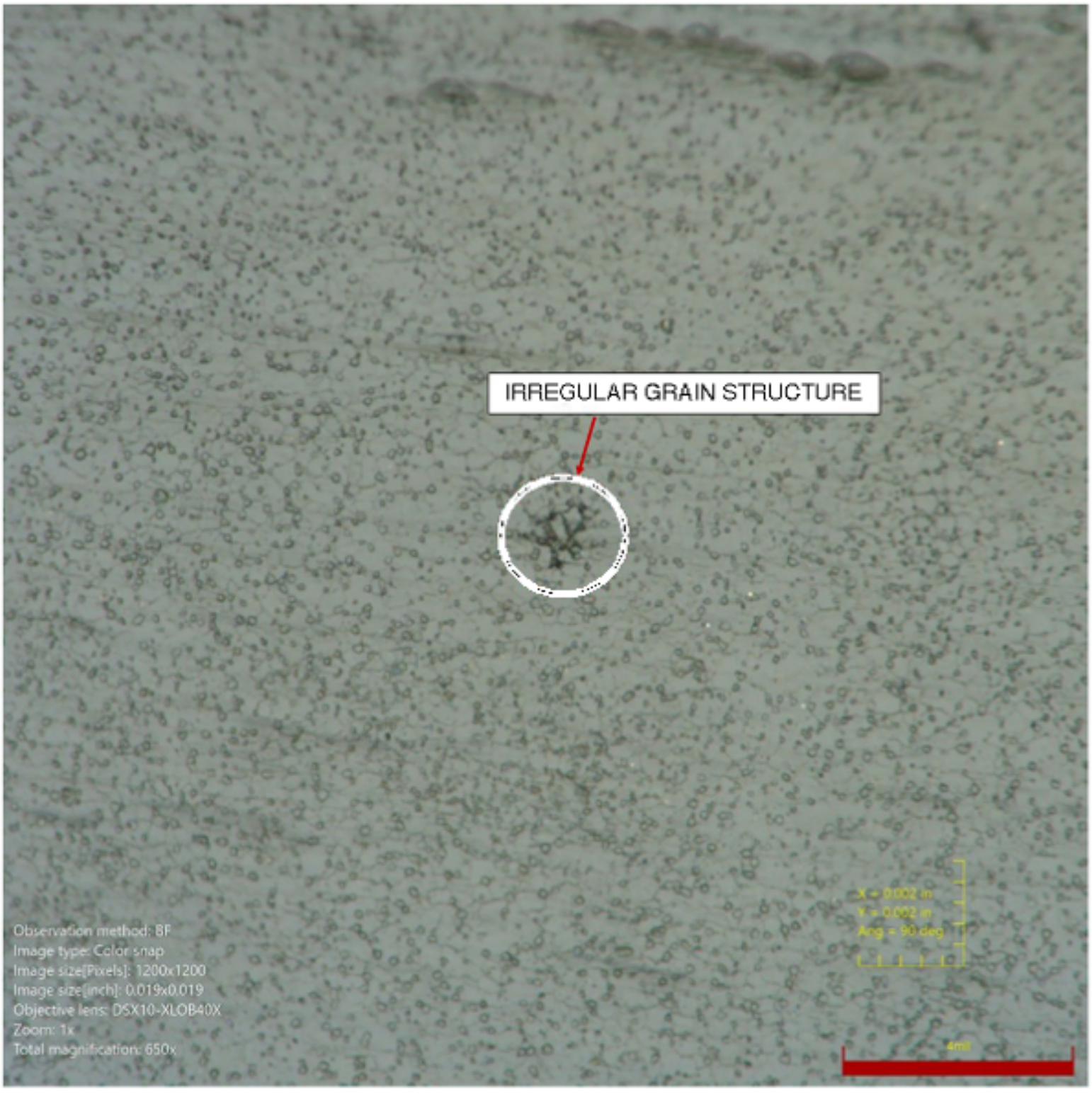

IRREGULAR GRAIN STRUCTURE, RENE 65, 650x

6042114-00

Figure 5 (Sheet 2) Unacceptable Grain Structure from Replication of Rene 65 - Evidence of an Irregular Grain Structure

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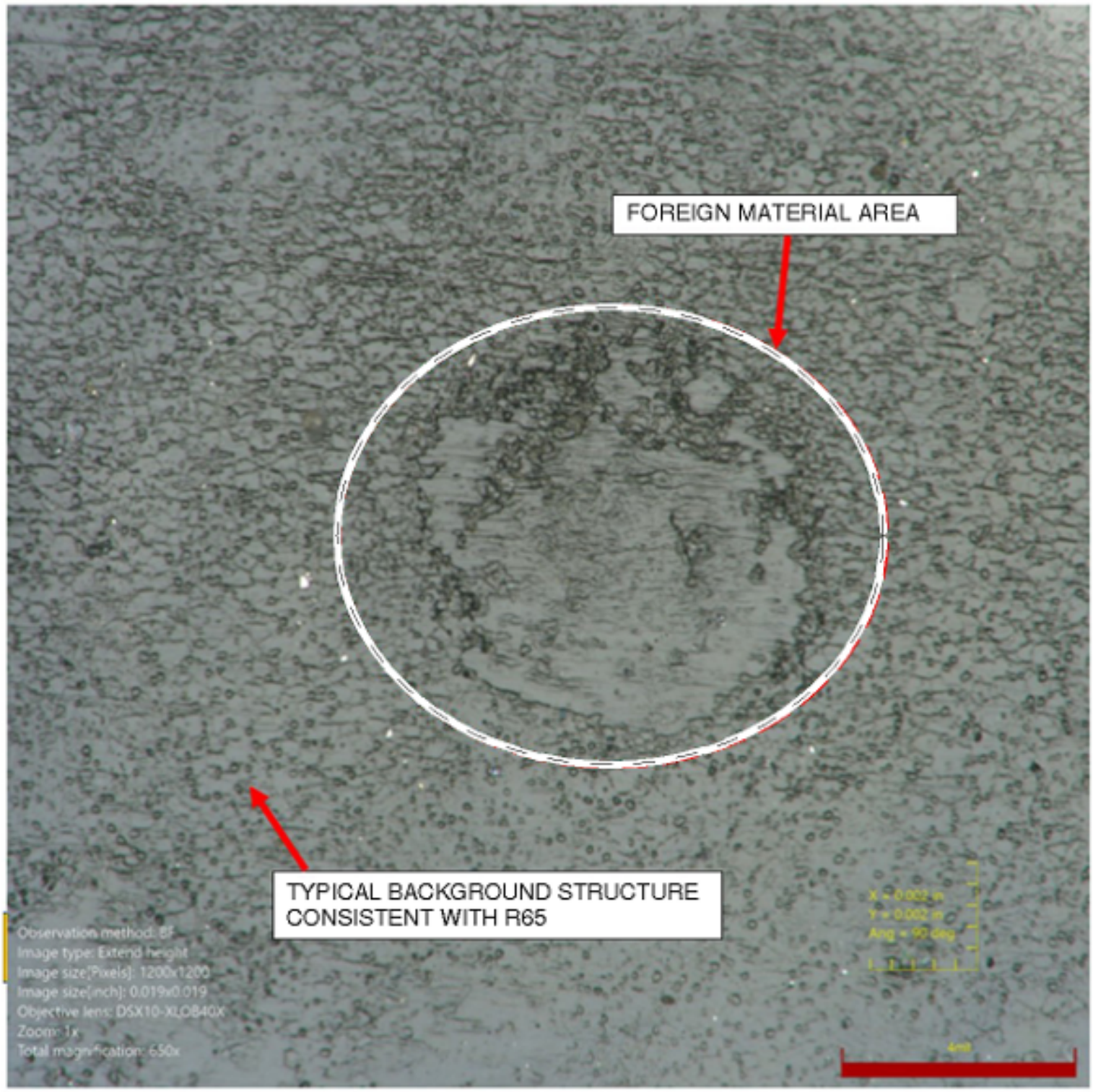

FOREIGN MATERIAL AREA AND TYPICAL BACKGROUND STRUCTURE, RENE 65, 650X

6042116-00

Figure 5 (Sheet 3) Unacceptable Grain Structure from Replication of Rene 65 - Evidence of Foreign Material With Different Grain Structure