

NATIONAL TRANSPORTATION SAFETY BOARD

Office of Research and Engineering
Materials Laboratory Division
Washington, D.C. 20594



May 5, 2016

MATERIALS LABORATORY FACTUAL REPORT

Report No. 15-129

A. ACCIDENT INFORMATION

Place : Indian Lake Estates, FL
Date : March 14, 2015
Vehicle : Richard Fuist Rotorway Talon (N220AF)
NTSB No. : ERA15LA155
Investigator : Stephen Stein (AS-WPR)

B. COMPONENTS EXAMINED

1. Two T25C Lamiflex¹ elastomeric bearings, numbers 5579 and 5580
2. Two thrust blocks with the following markings:
 - A. 6526 .0013 S
 - B. 6526 .001 M

C. DETAILS OF THE EXAMINATION

The purpose of this investigation is to determine if there are any unusual observations for a pair of Lamiflex elastomeric bearings and their associated thrust blocks that could affect collective "feel" during flight.

The as-received thrust blocks are shown in Figures 1 through 4. The block bodies are fabricated from aluminum alloy. The outside diameters of the counter bore bearing pockets are lined with a thin sleeve of polyoxymethylene (as verified by Fourier transform infrared spectroscopy). No anomalous wear scar patterns were observed within the counter bores and associated sleeves.

The as-received elastomeric bearings are shown in Figure 5. The bearings are composed of top, center, and bottom steel annular disks bonded with alternating layers of elastomer and 0.002-inch thick brass annular disks. No anomalous wear scar patterns were observed on any of the bearing surfaces. Figures 6 through 13 show closer microscope images of the bearing laminate structure and inter-laminate extrusion of elastomer at the inside and outside diameter surfaces.

Under the supervision of an FAA Flight Standard District Office representative, the elastomeric bearings were evaluated for torsional stiffness and lateral bulge at the manufacturer of the bearings, [REDACTED]. The torsional stiffness

¹ Registered trademark of Randolph Research Company, Akron, OH.

and lateral bulge data of the as-received bearings is summarized in Tables 1 and 2. Table 3 summarizes the lateral bulge measurements of the accident bearings in the as-manufactured condition. The manufacturer's specification for torsional stiffness is 10 lbf-inch/degree to 13 lbf-inch/degree and the lateral bulge shall be less than 0.040 inch.

Table 1—Torsional stiffness (after accident)

Compressive load (lbf)	Hysteresis factor, H	Stiffness factor, K (lbf/inch)	Torsional stiffness based on 4° rotation (lbf-inch/degree)
15,000	2.9%	18.0	9.47
20,000	3.5%	18.4	9.84

Table 2—Lateral bulge at 15,000 lbf and 30,000 lbf (after accident)

Bearing	30,000 lbf			15,000 lbf		
	x (inch)	y (inch)	$\sqrt{x^2 + y^2}$ (inch)	x (inch)	y (inch)	$\sqrt{x^2 + y^2}$ (inch)
5879	-0.002	0.013	0.0132	0	-0.004	0.004
5880	-0.006	0.018	0.0190	0	-0.005	0.005

Table 3—Lateral bulge at 30,000 lbf (as-manufactured)

Bearing	0°			180°		
	x (inch)	y (inch)	$\sqrt{x^2 + y^2}$ (inch)	x (inch)	y (inch)	$\sqrt{x^2 + y^2}$ (inch)
5879	0.002	0.014	0.0141	-0.005	-0.014	0.0149
5880	0.008	0.018	0.0197	-0.009	-0.017	0.0192

Michael Budinski
Chief, Materials Laboratory Division

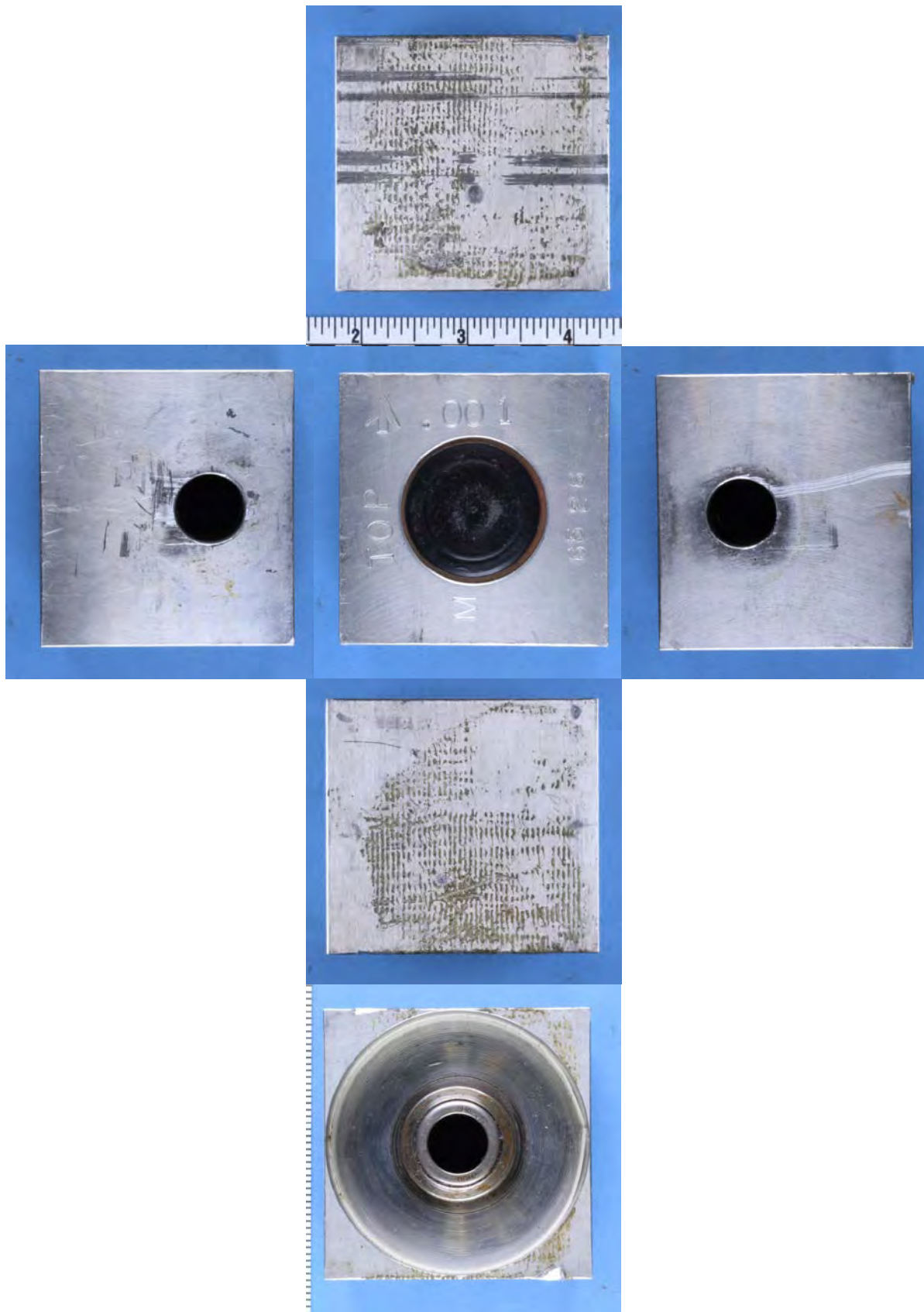


Figure 1 Image showing all sides of the "M" thrust block.

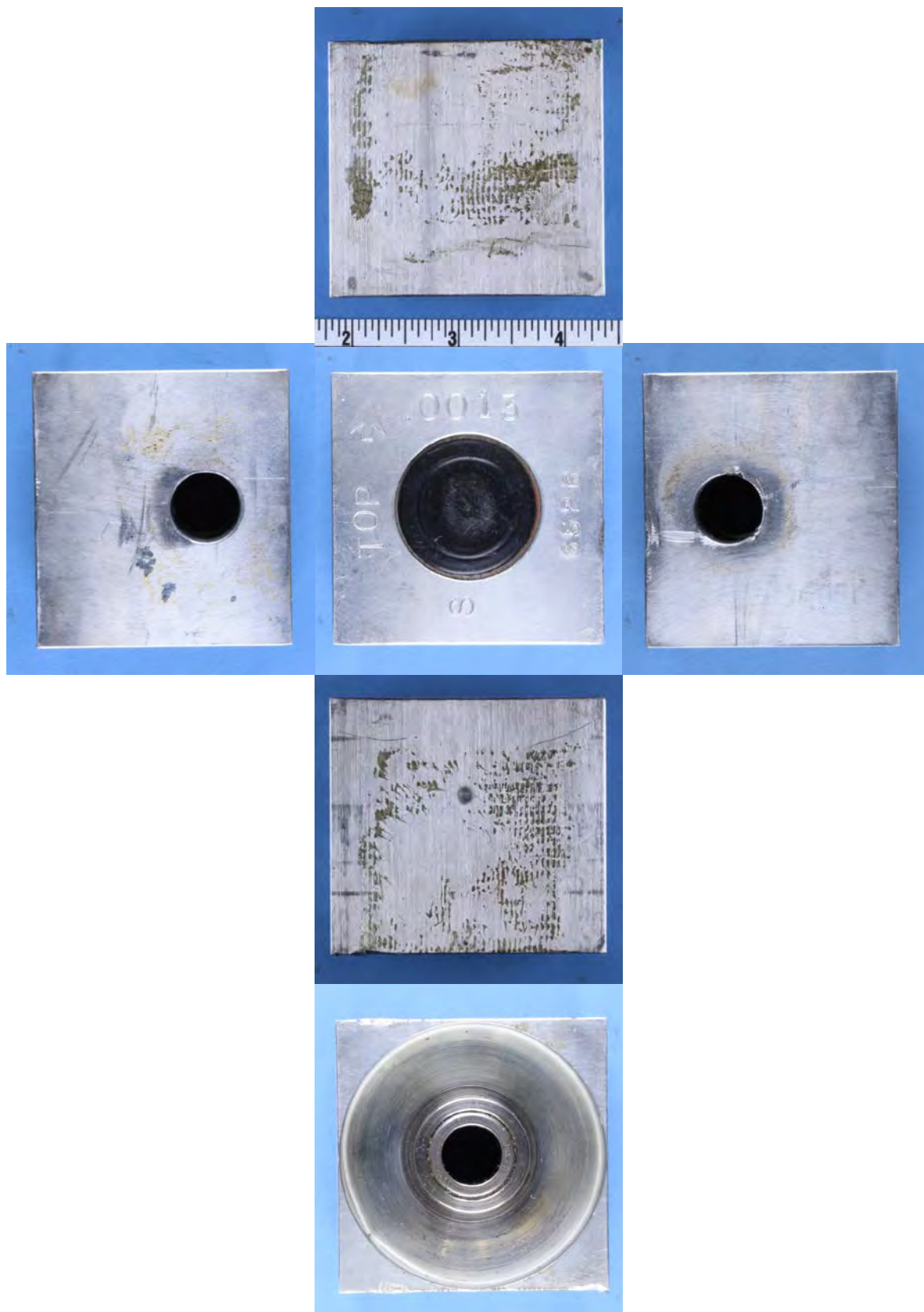


Figure 2 Image showing all sides of the "S" thrust block.

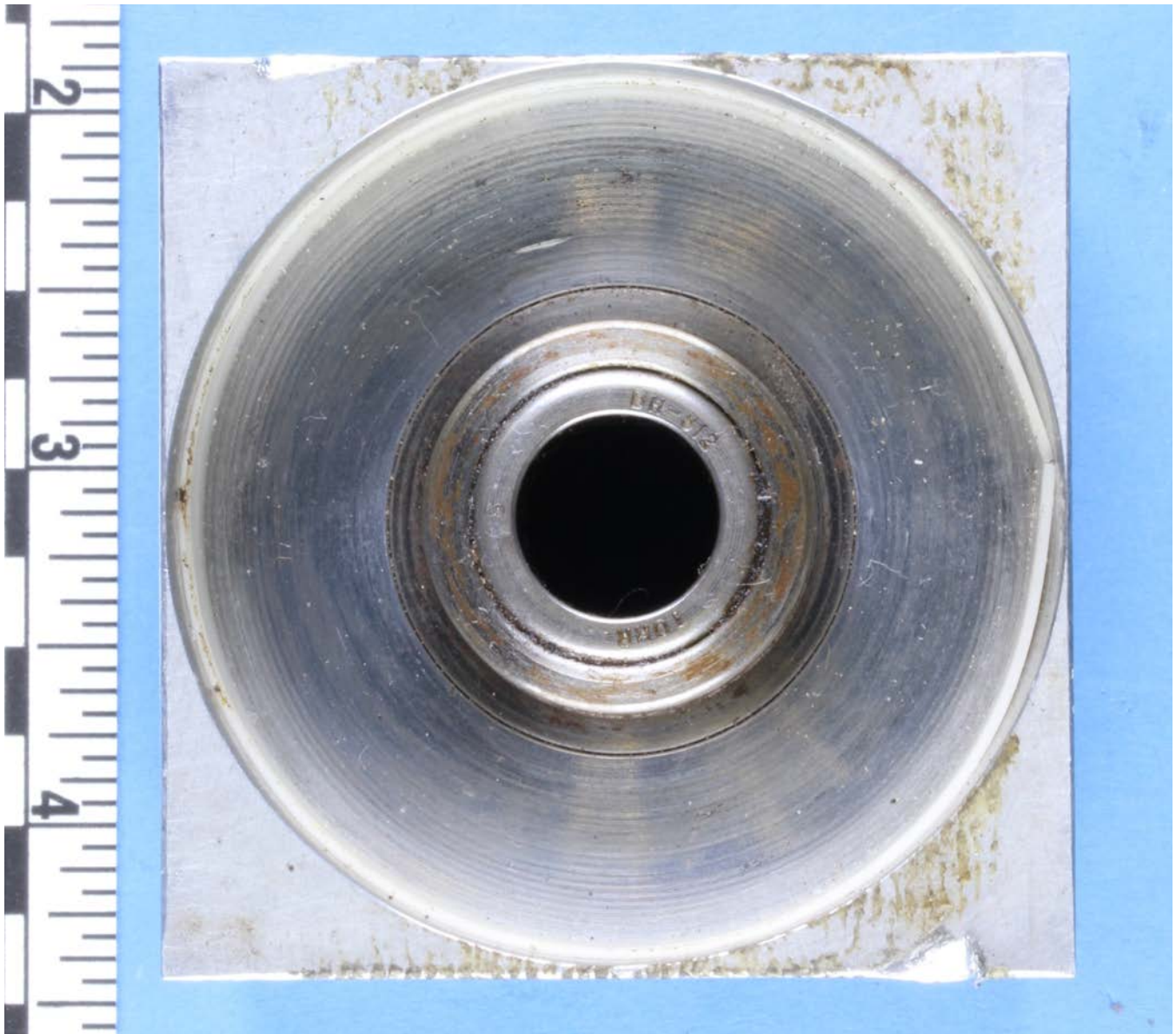


Figure 3 Closer view of the Lamiflex bearing pocket shown in Figure 1.

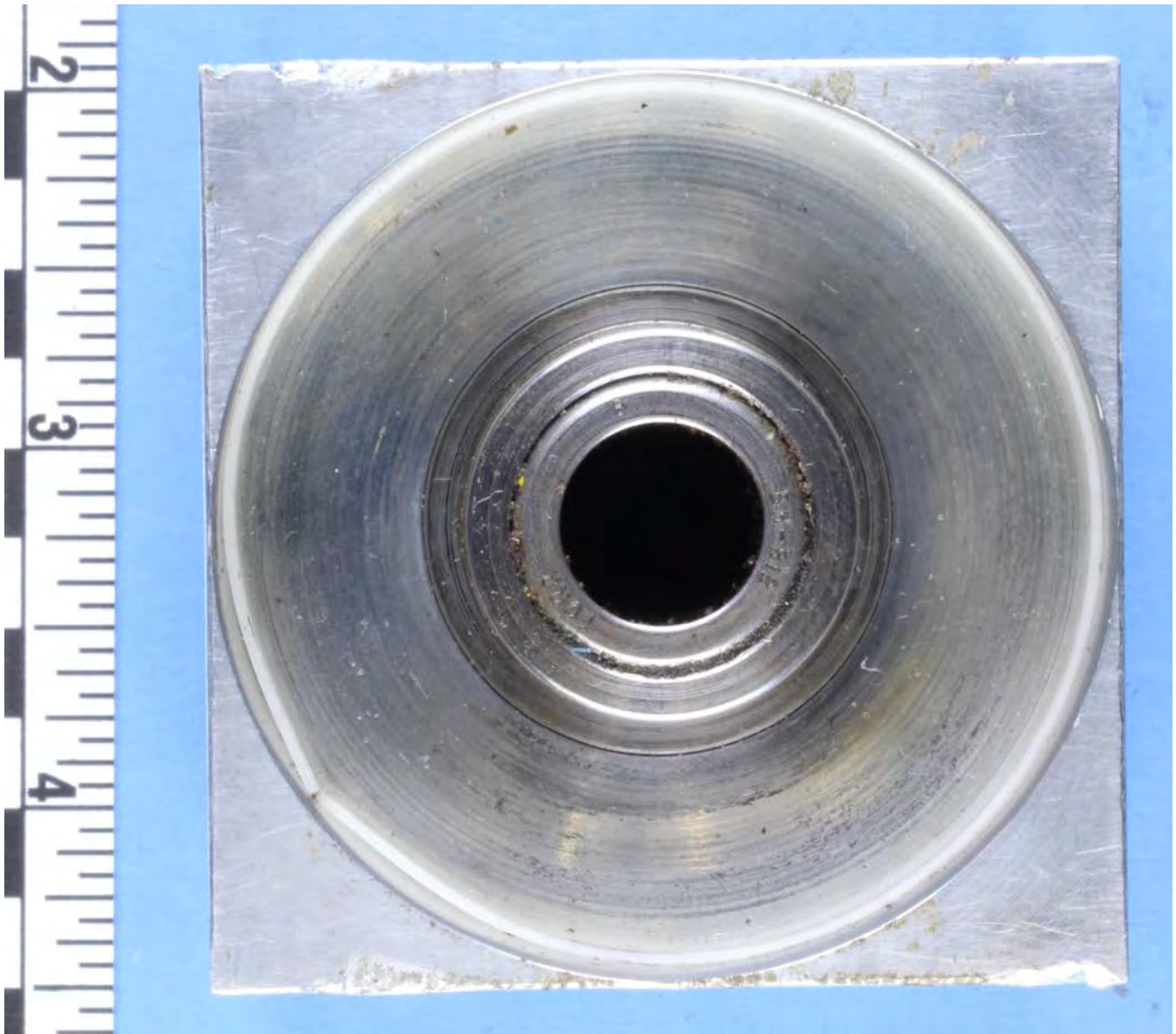


Figure 4 Closer view of the Lamiflex bearing pocket shown in Figure 2.

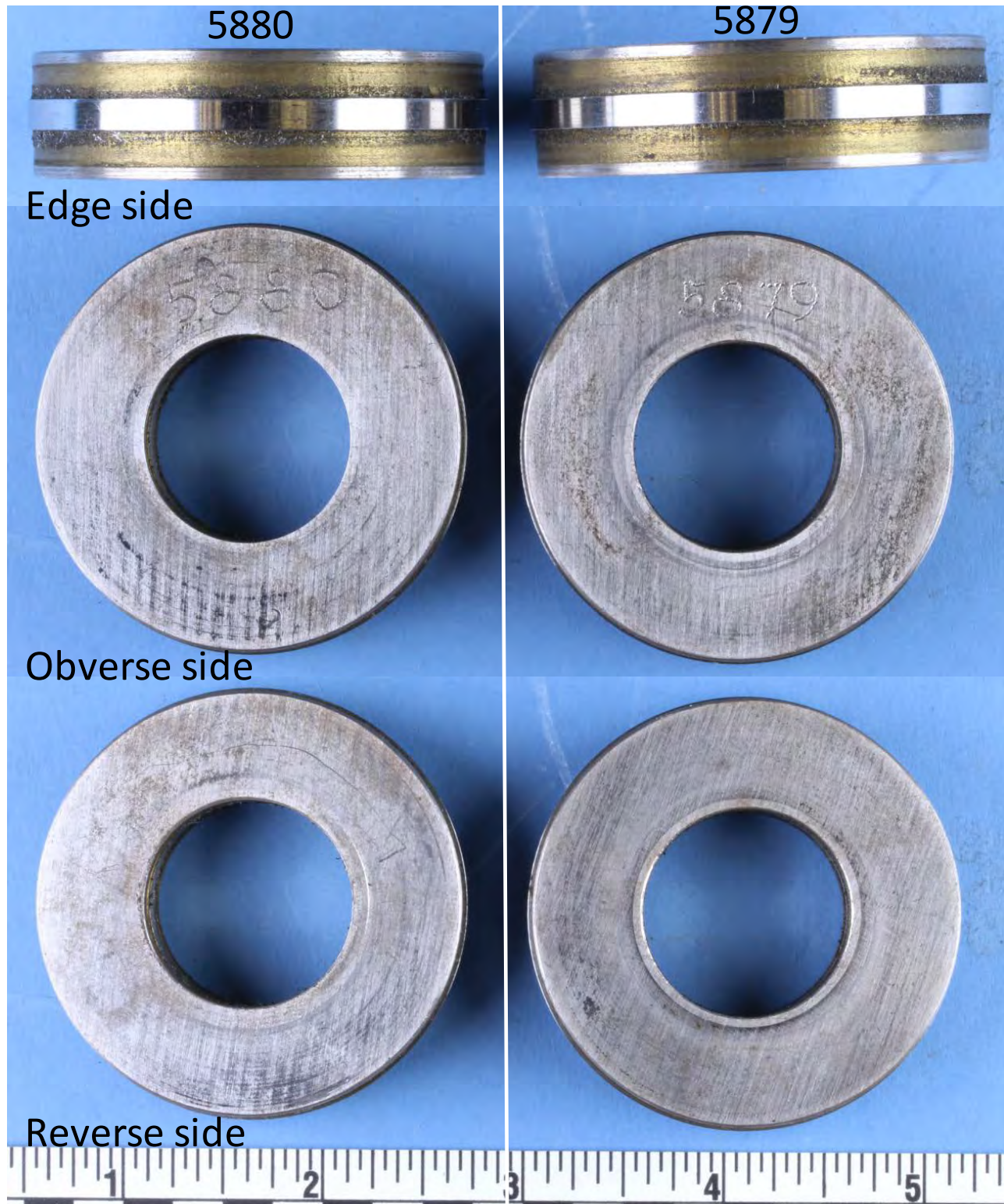


Figure 5 As received images of the Lamiflex bearings.

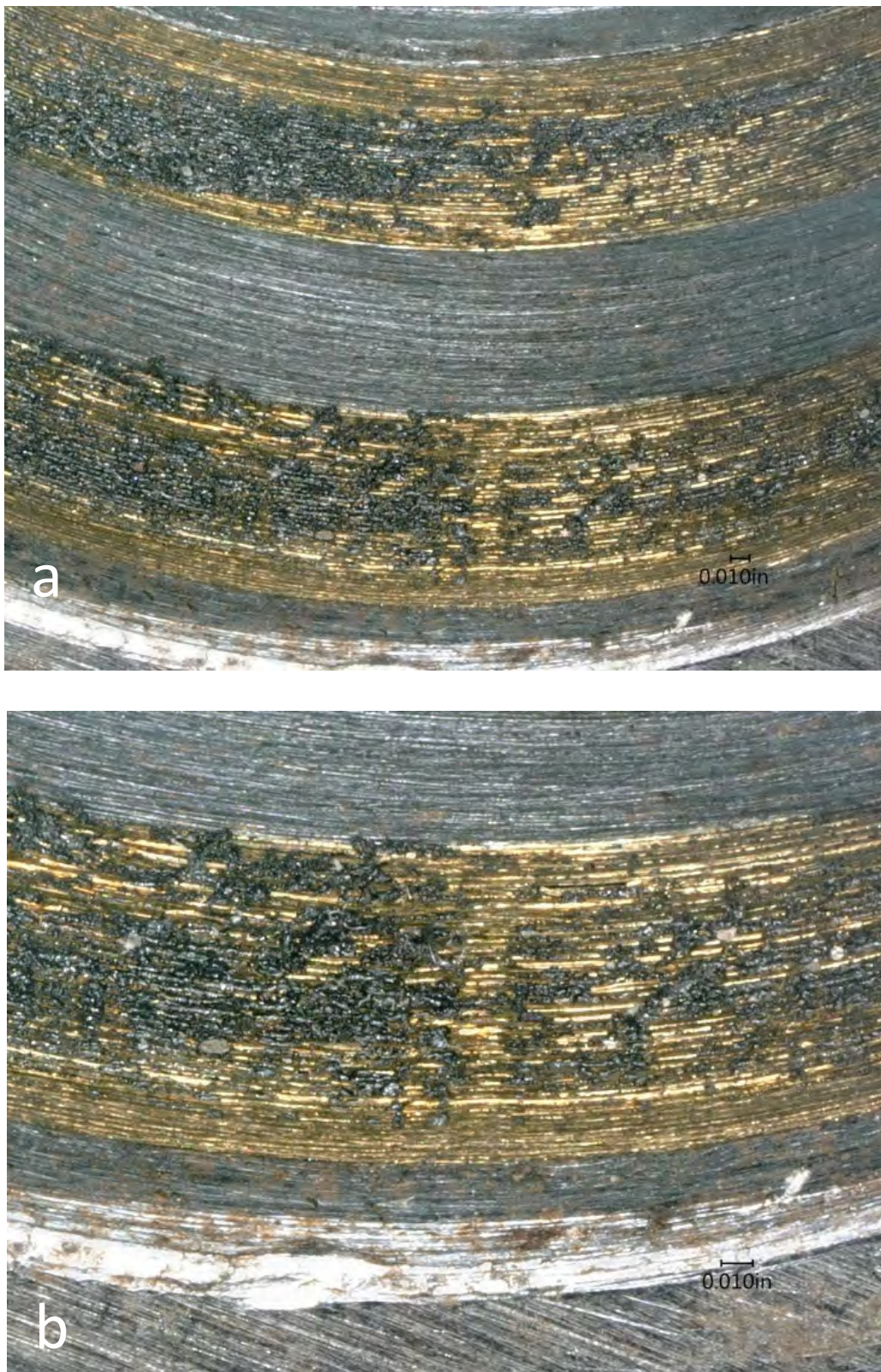


Figure 6 Close views of the number 5579 Lamiflex inside diameter surface.

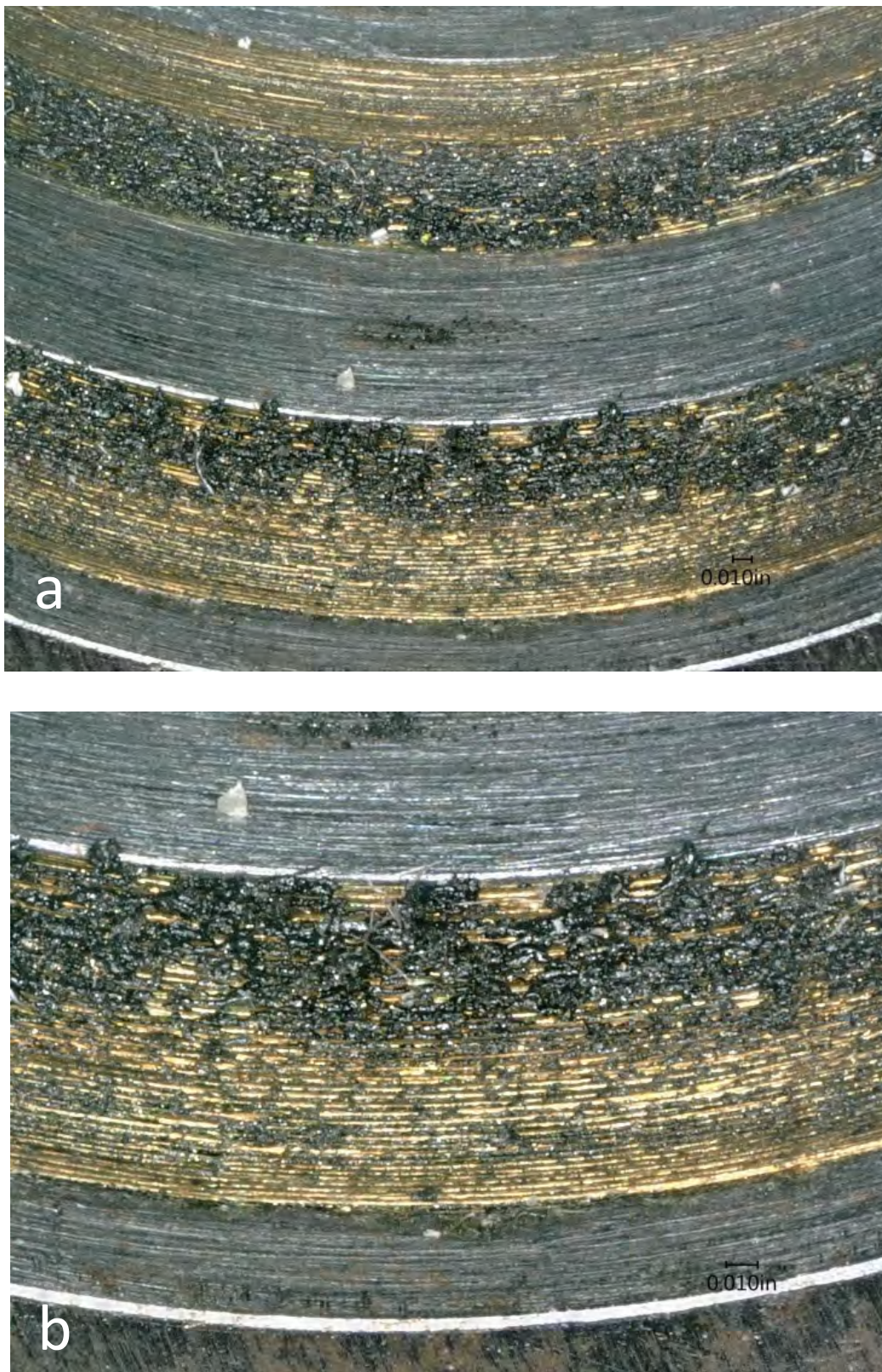


Figure 7 Close views of the number 5580 Lamiflex inside diameter surface.

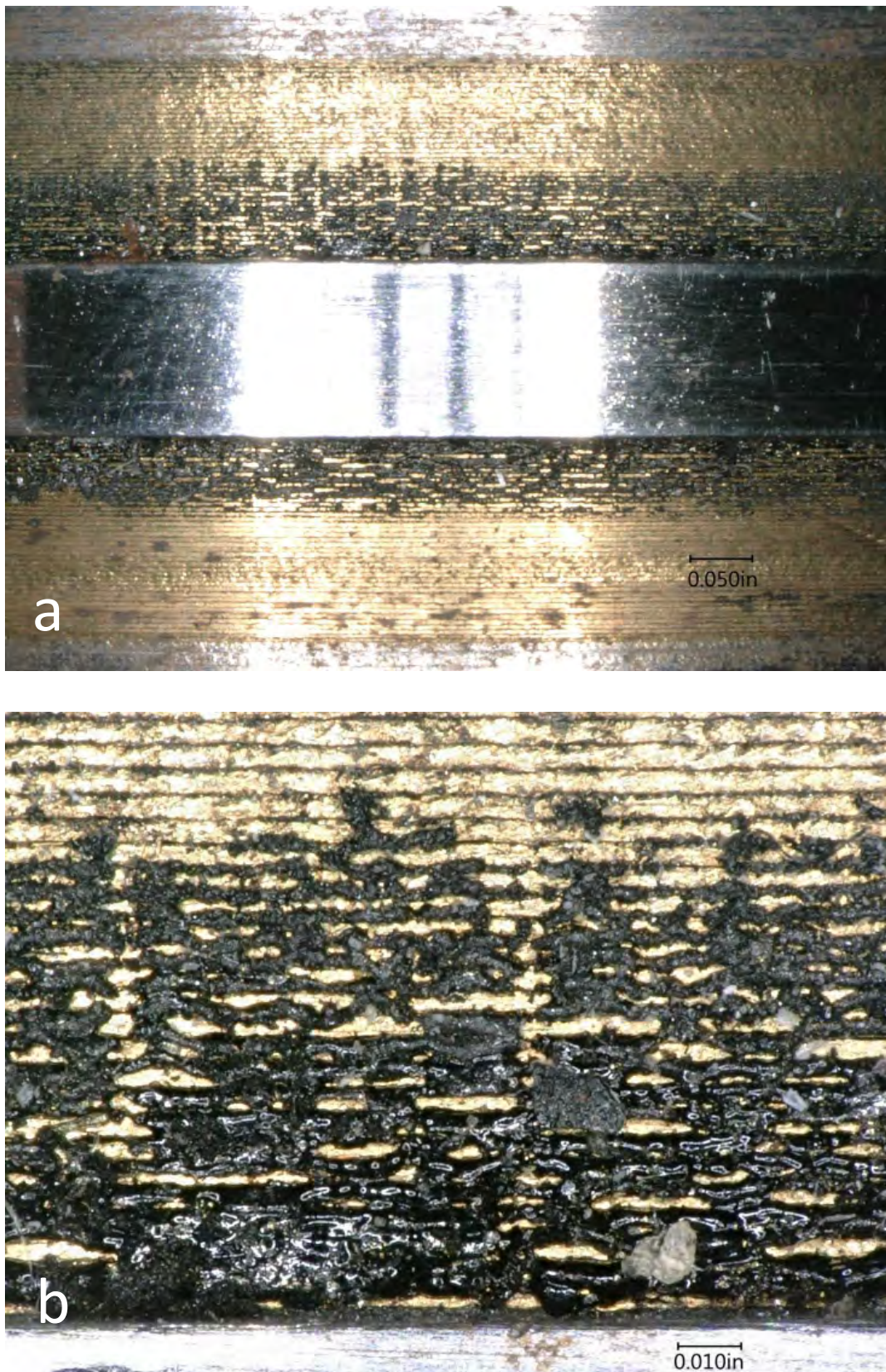


Figure 8 Close views of the number 5579 Lamiflex bearing outside diameter surface.

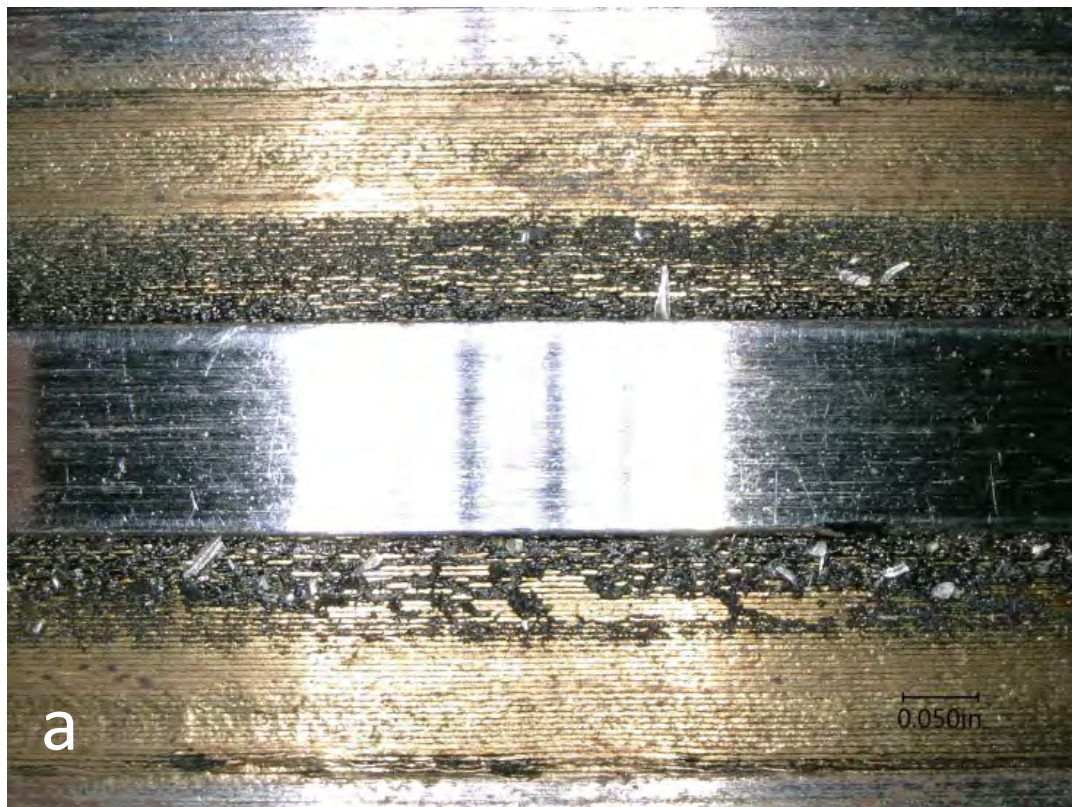


Figure 9 Close views of the number 5580 Lamiflex bearing outside diameter surface.

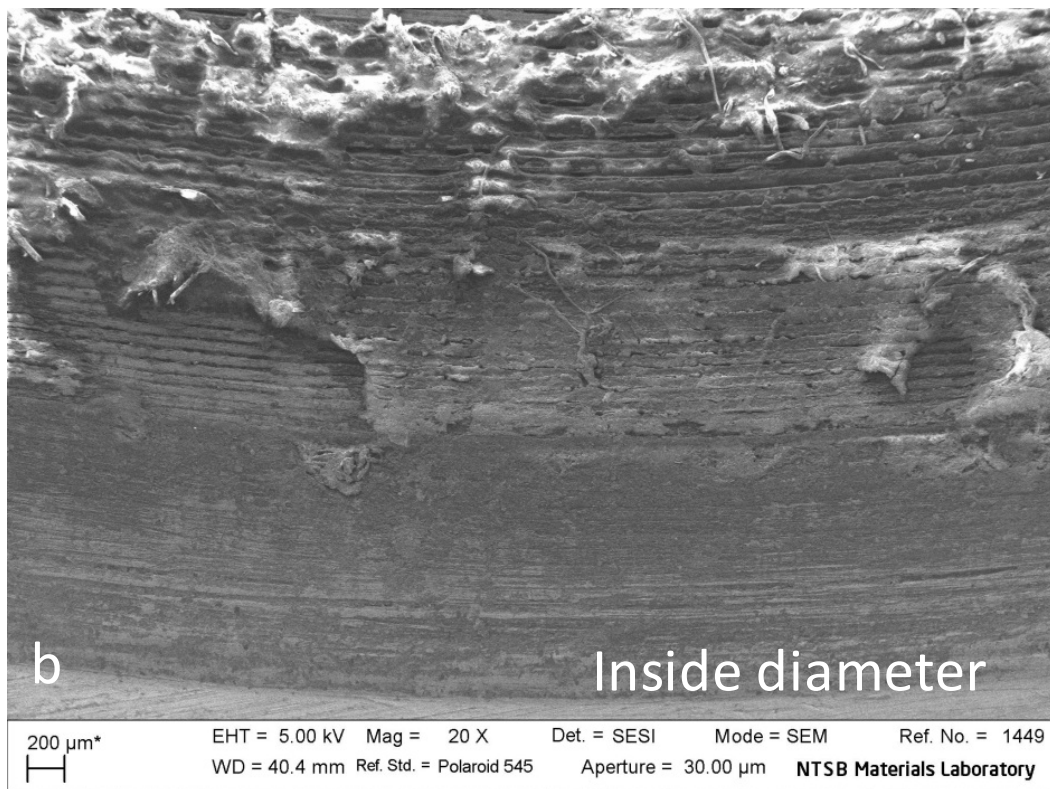
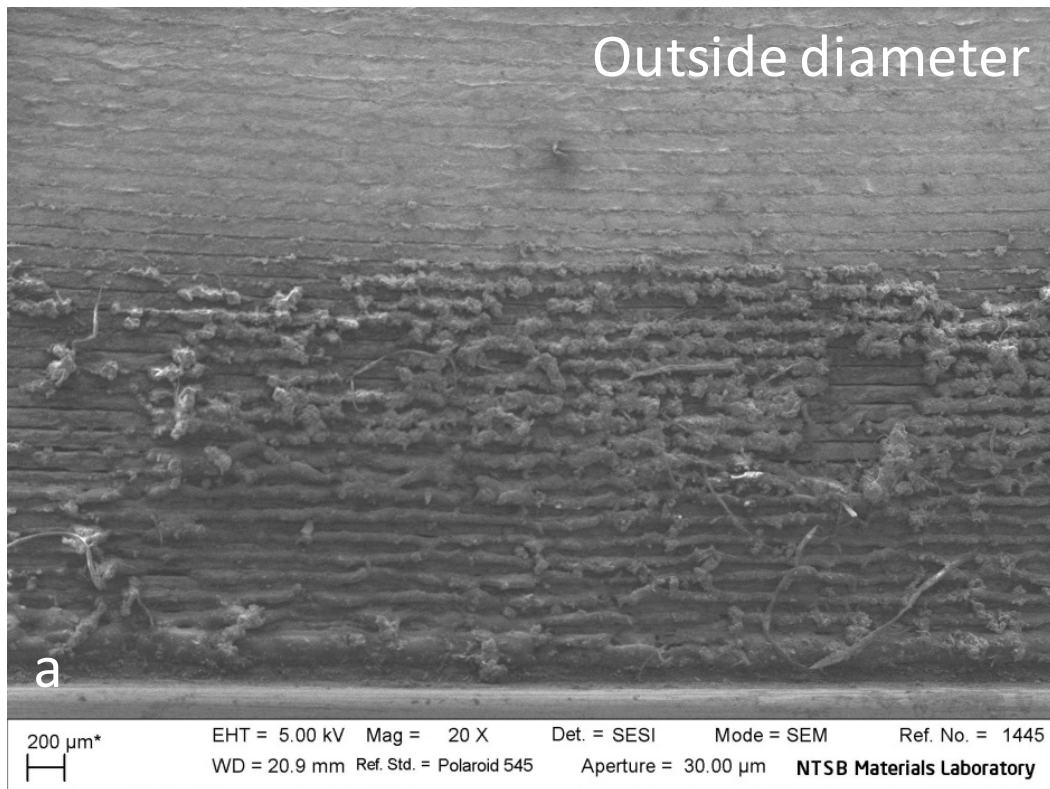


Figure 10 Scanning electron microscope images of the inside and outside diameter of the number 5579 Lamiflex bearing.

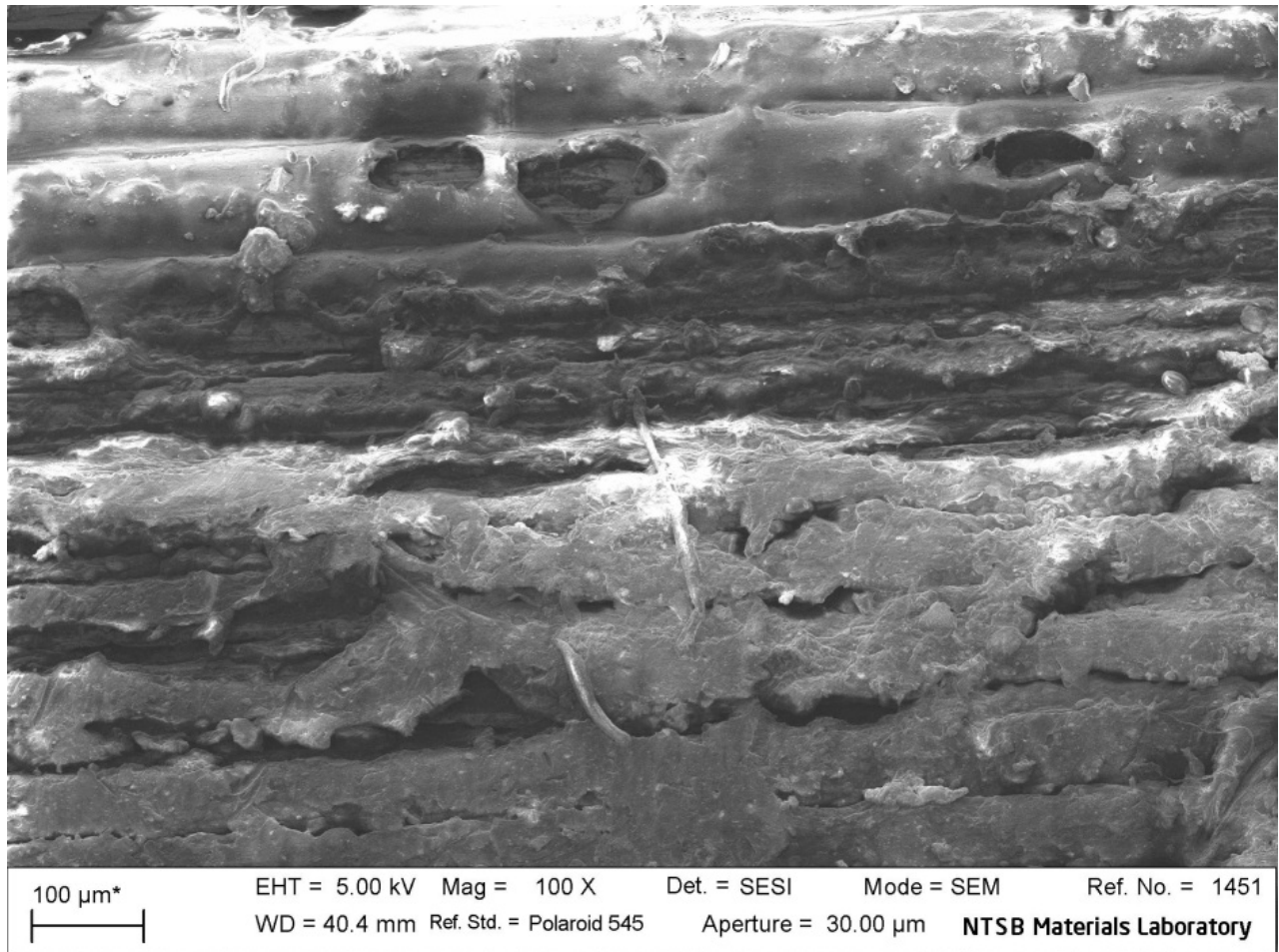


Figure 11 Closer scanning electron microscope image of the outside diameter surface of the number 5579 Lamiflex bearing.

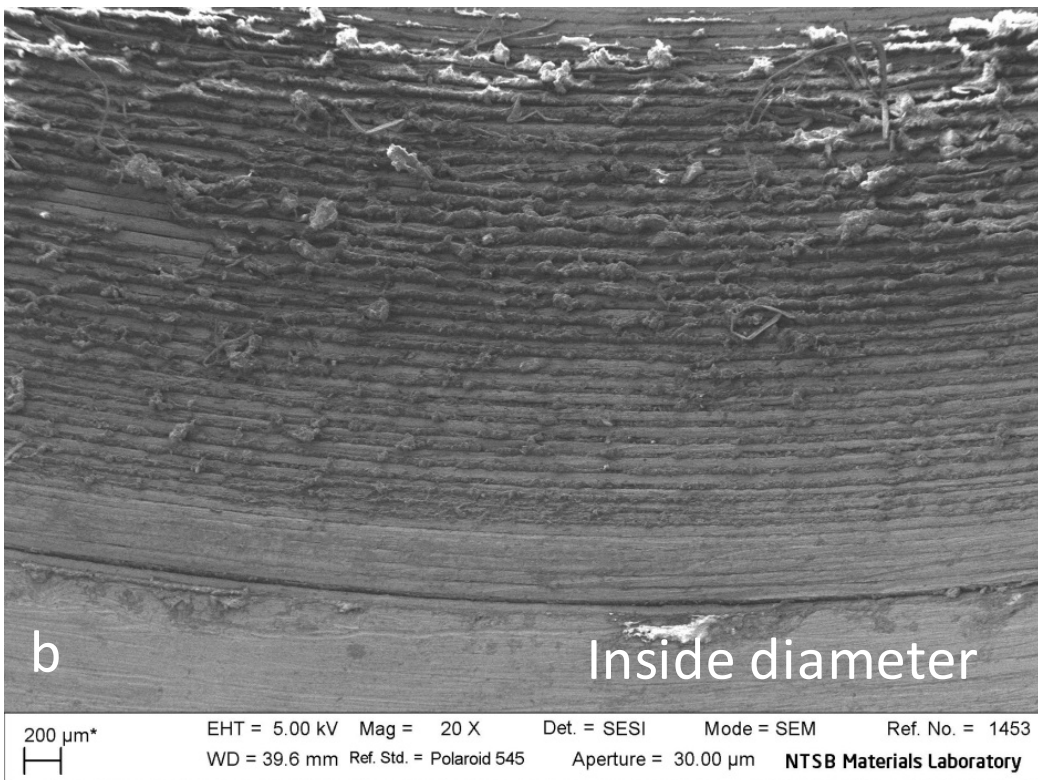
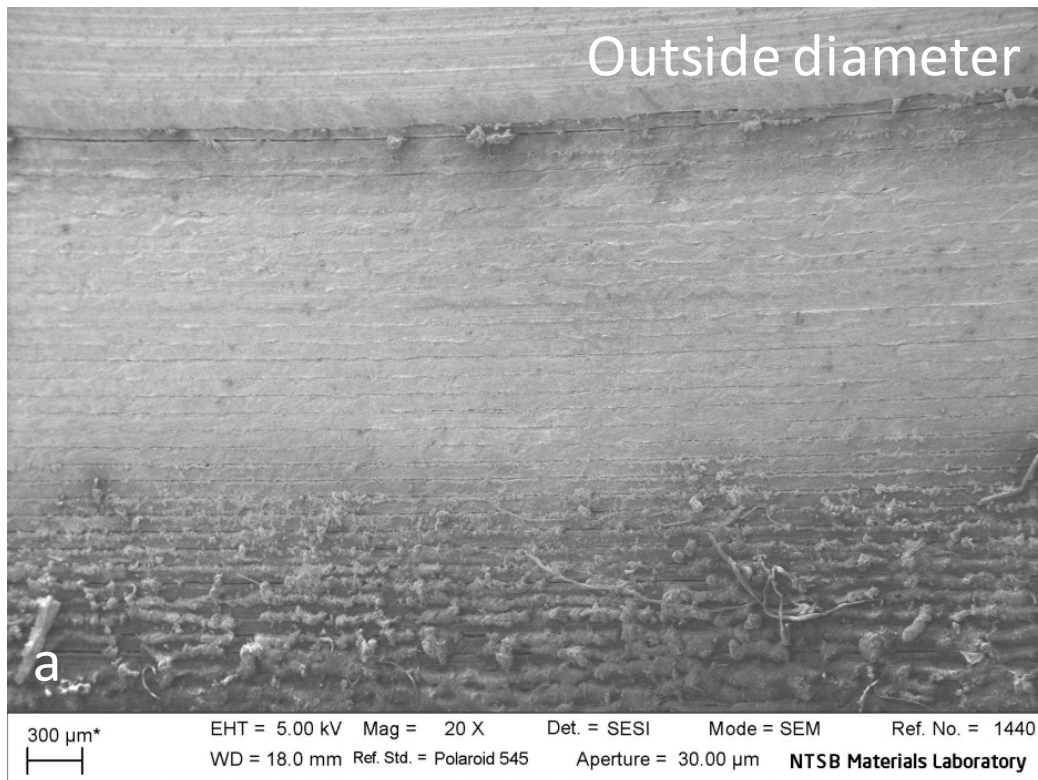


Figure 12 Scanning electron microscope images of the inside and outside diameter of the number 5580 Lamiflex bearing.

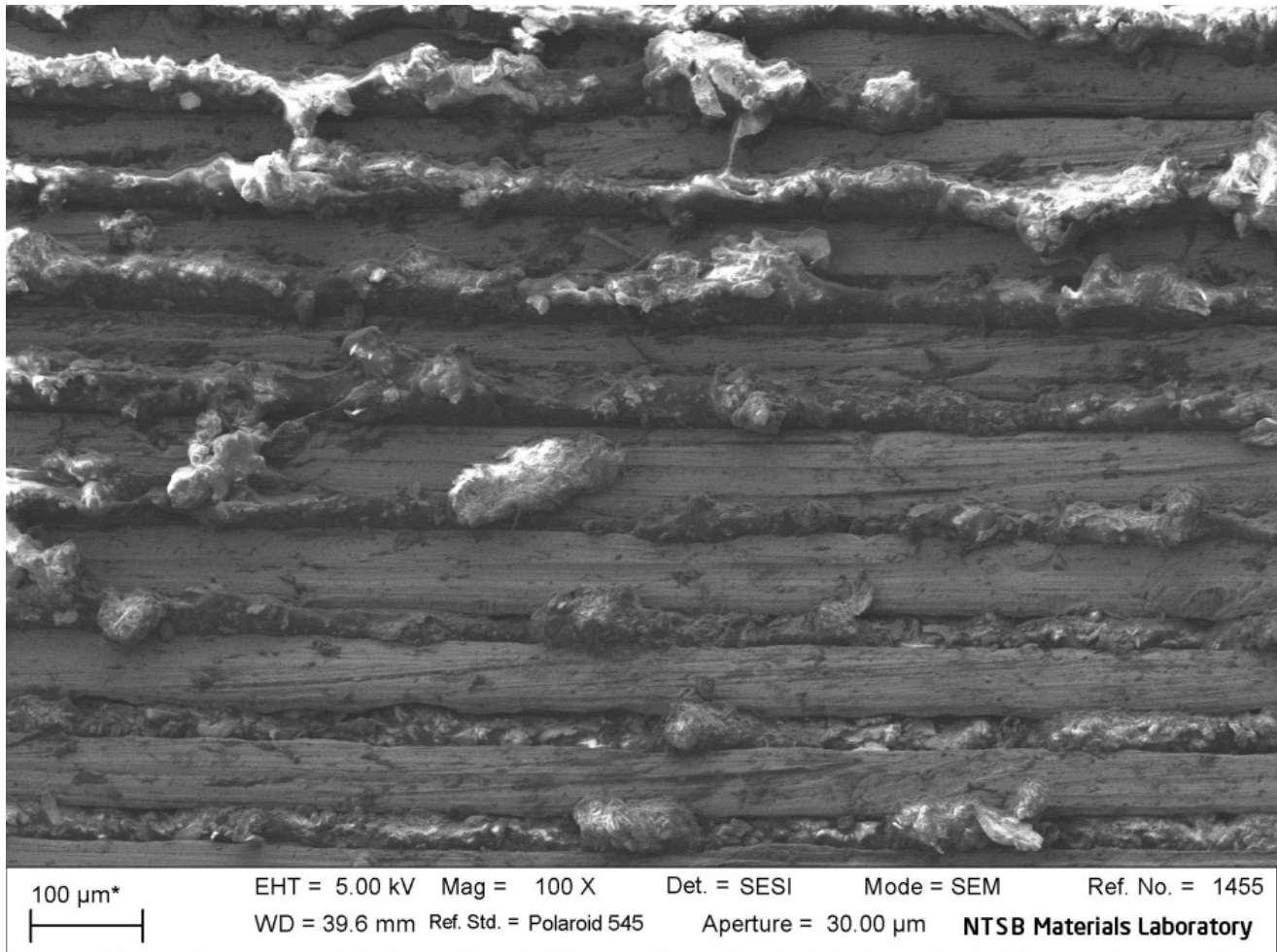


Figure 13 Closer scanning electron microscope image of the outside diameter surface of the number 5580 Lamiflex bearing.