

National Transportation Safety Board

Office of Research and Engineering

Washington, DC 20594



CEN22FA021

MATERIALS LABORATORY

Factual Report 22-077

November 2, 2022

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A. ACCIDENT INFORMATION

Location: Lena, WI
Date: October 27, 2021
Vehicle: Beech B36TC, N75RM
Investigator: Timothy Sorensen

B. COMPONENTS EXAMINED

Pilot side oxygen fitting assembly (Figure 1)

C. EXAMINATION PARTICIPANTS

Specialist Joseph Panagiotou
National Transportation Safety Board
Washington, DC

Engineering Technician Edward Komarnicki
National Transportation Safety Board
Washington, DC

D. DETAILS OF THE EXAMINATION

The pilot side oxygen fitting in question was a ninety-degree elbow fitting with an NPT male thread on one end and an NPT female thread on the other. The portion of the fitting with the NPT female thread exhibited a crack extending from the open end of the fitting towards the center (Figure 2).

The female threaded end of the fitting was sectioned where the crack terminated and separated from the rest of the elbow fitting. The crack was then opened for examination (Figure 3). The fracture faces exhibited a duller appearance for the first couple threads into the crack after which the appearance was brighter. One side of the fracture surface exhibited an area with Teflon thread sealant embedded onto the surface (Figure 4). The area exhibiting the embedded Teflon thread sealant began at approximately the first thread and extended down to the third thread. The area exhibiting the embedded Teflon thread sealant did not extend the full width of the crack.

The fracture surface half that did not contain the embedded Teflon thread sealant was examined using a scanning electron microscope (SEM). Figure 5 depicts the approximate areas (labeled A1 through A4) where photomicrographs were taken. In area A1 (Figure 6) the fracture surface was smooth and featureless without the presence of fracture features, such as ductile dimples. The featureless fracture surface in area A1 is consistent with a casting defect in that area. Area A2 (Figure 7) exhibited

similar characteristics to area A1 but with more features. Area A3 (Figure 8) exhibited ductile dimples consistent with an overstress fracture. Area A4 (Figure 9) also exhibited ductile dimples consistent with an overstress fracture.

Energy dispersive spectroscopy (EDS) was performed on areas A1 and A4. The spectrum for area A1 revealed a major oxygen peak, consistent with the presence of aluminum oxide. The spectrum for area A4, with a trace oxygen peak, is typical for a fractured aluminum alloy.

Submitted by:

Joseph Panagiotou
Engineer

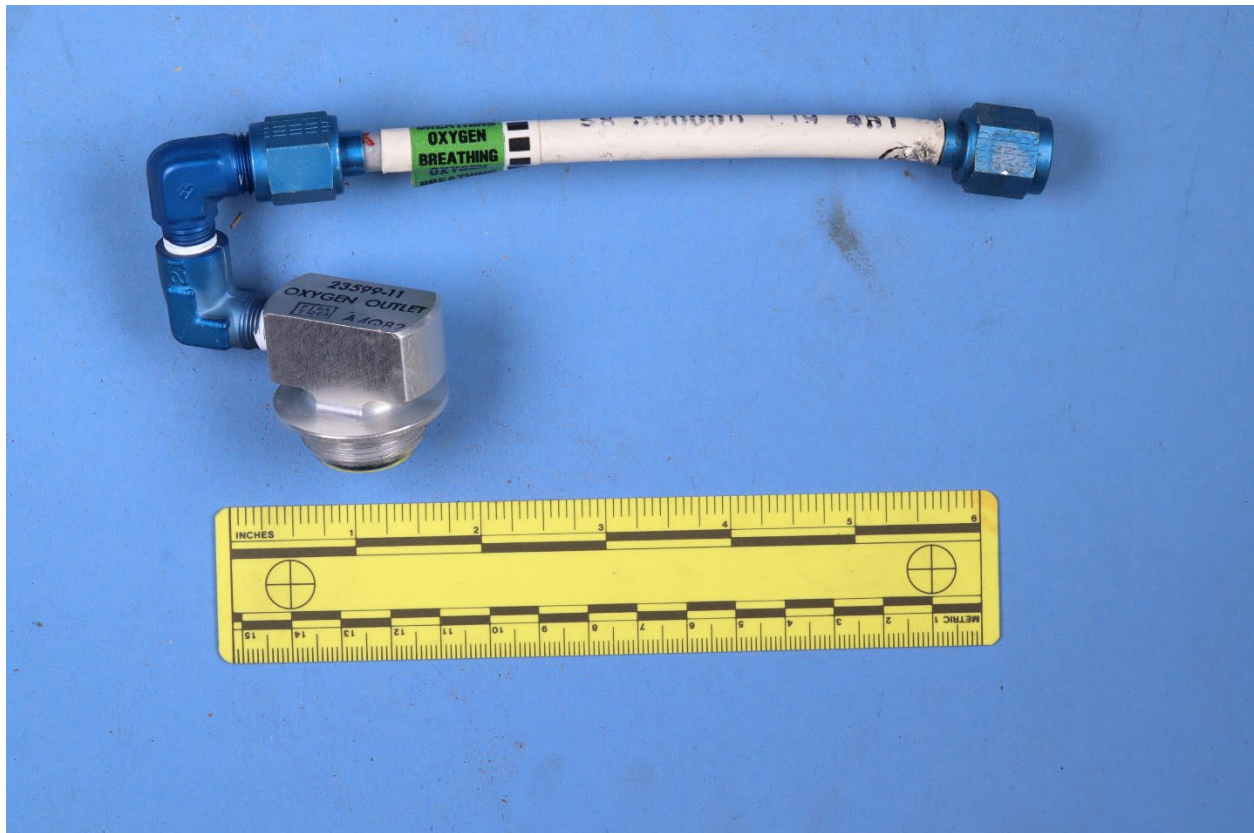


Figure 1. Pilot side oxygen fitting assembly as received.

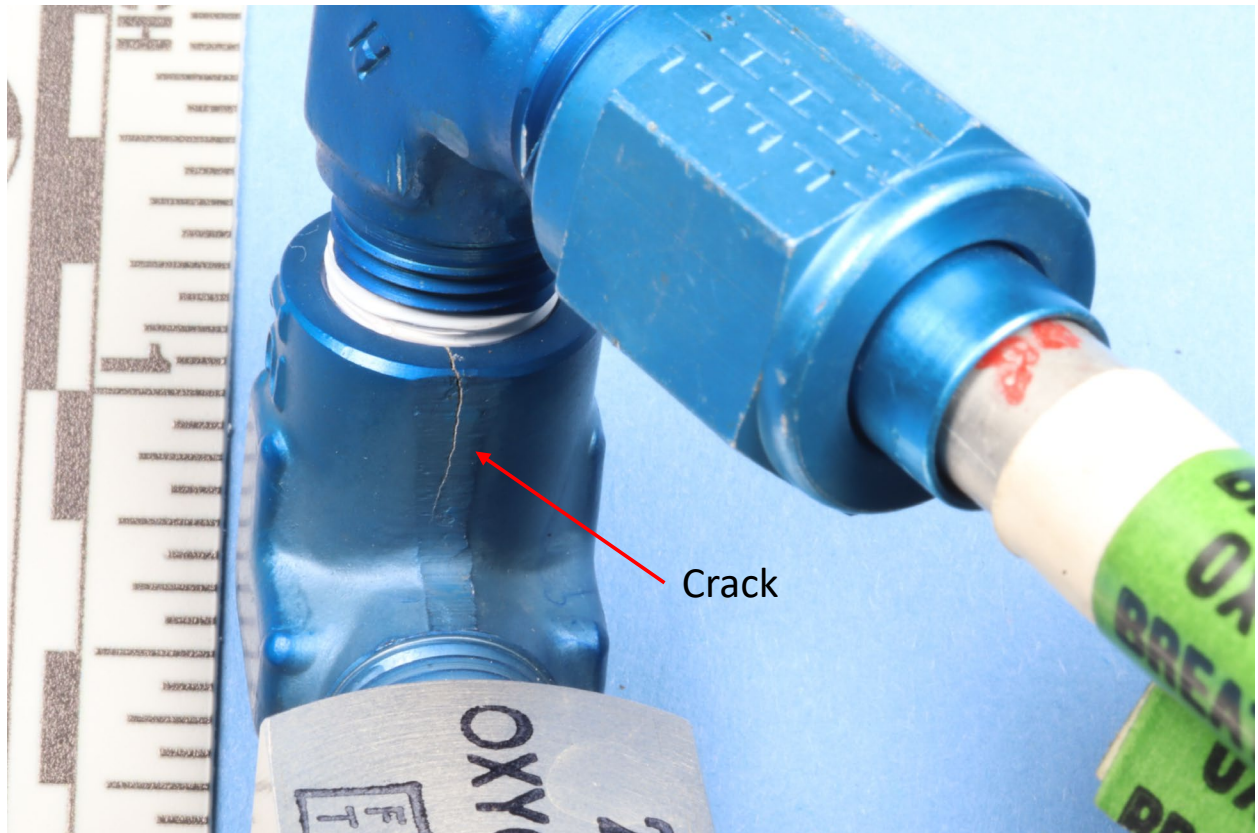


Figure 2. Cracked ninety-degree elbow fitting.

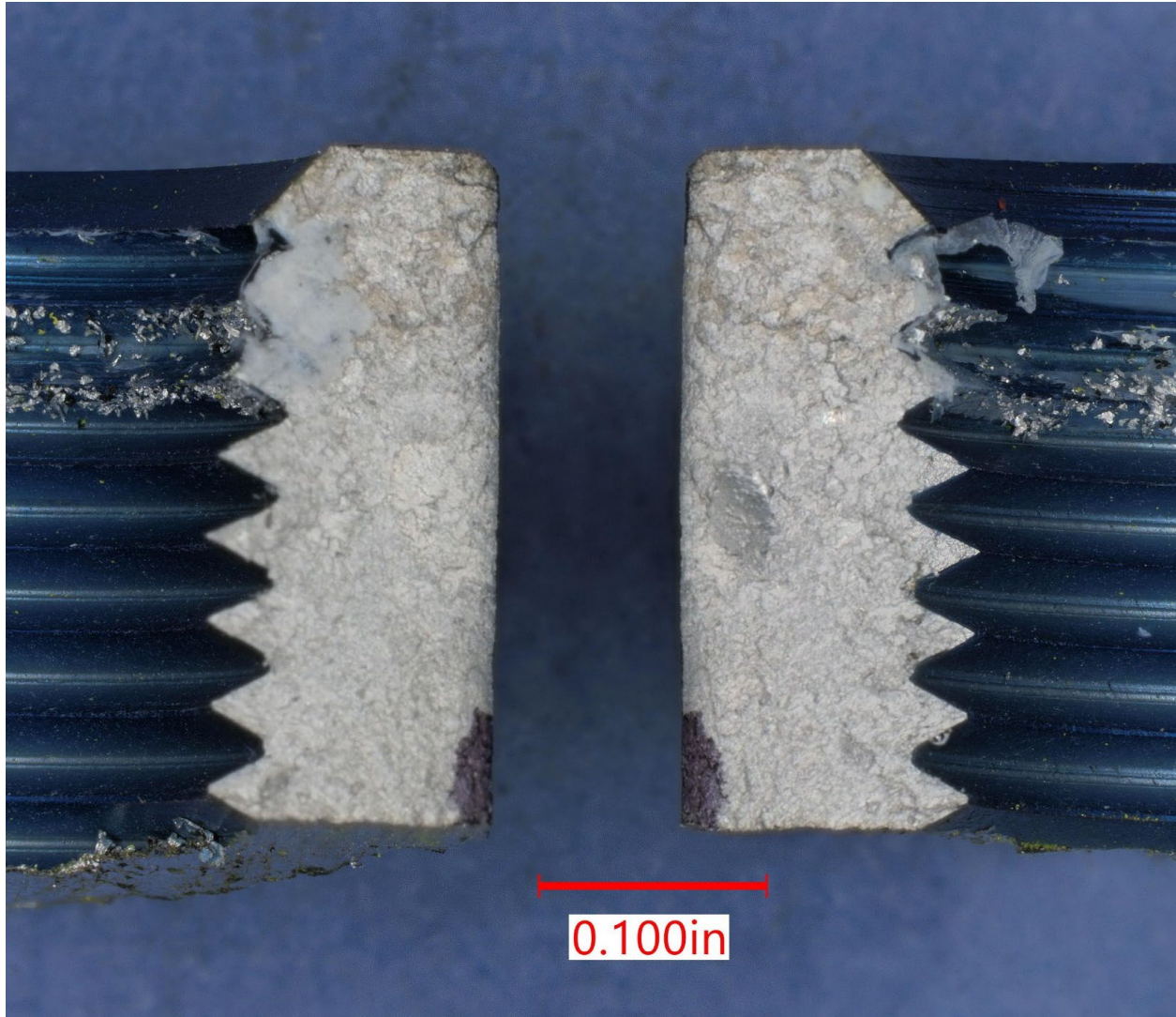


Figure 3. Crack opened for to reveal both halves of the fracture surface.

Teflon tape
residue

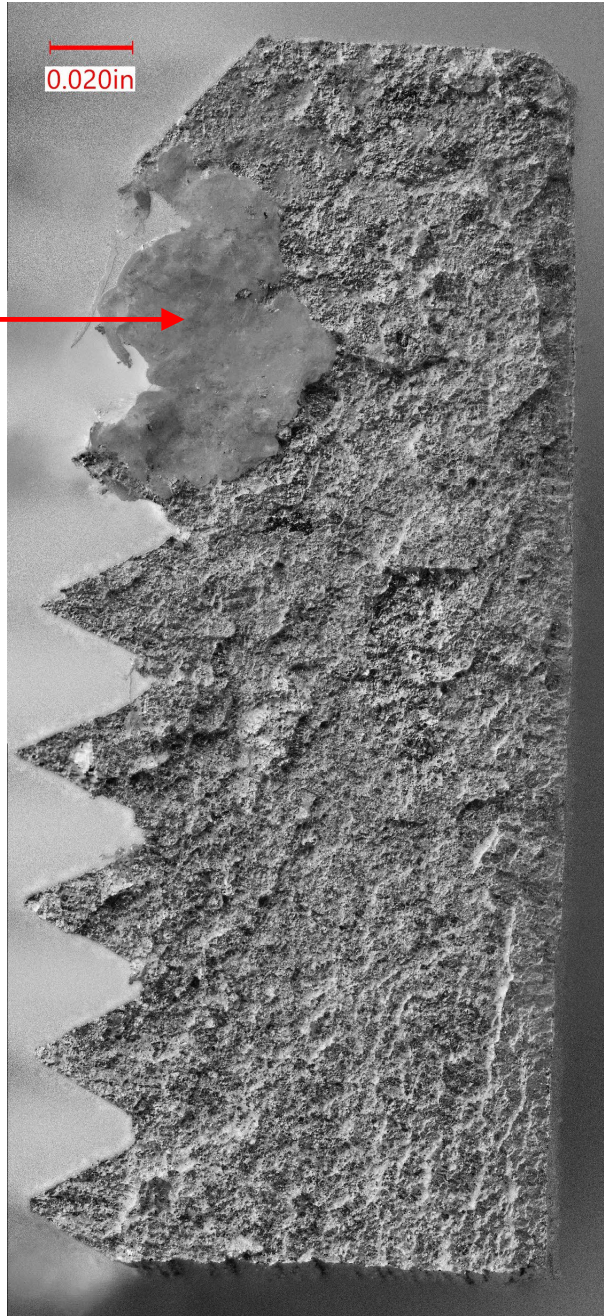


Figure 4. Fracture surface with embedded Teflon thread sealant.

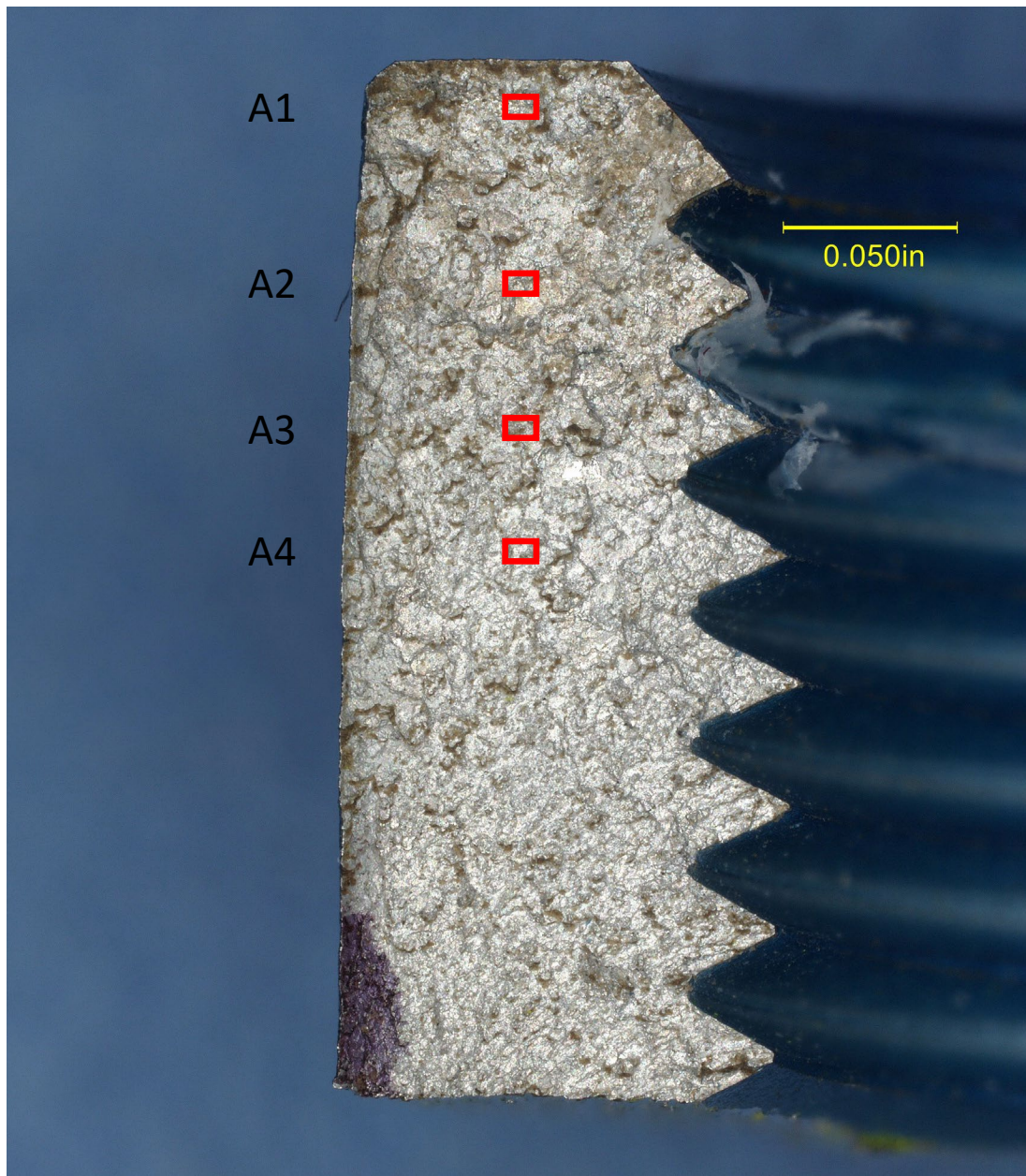


Figure 5. Fracture surface indicating approximate areas of SEM examination.

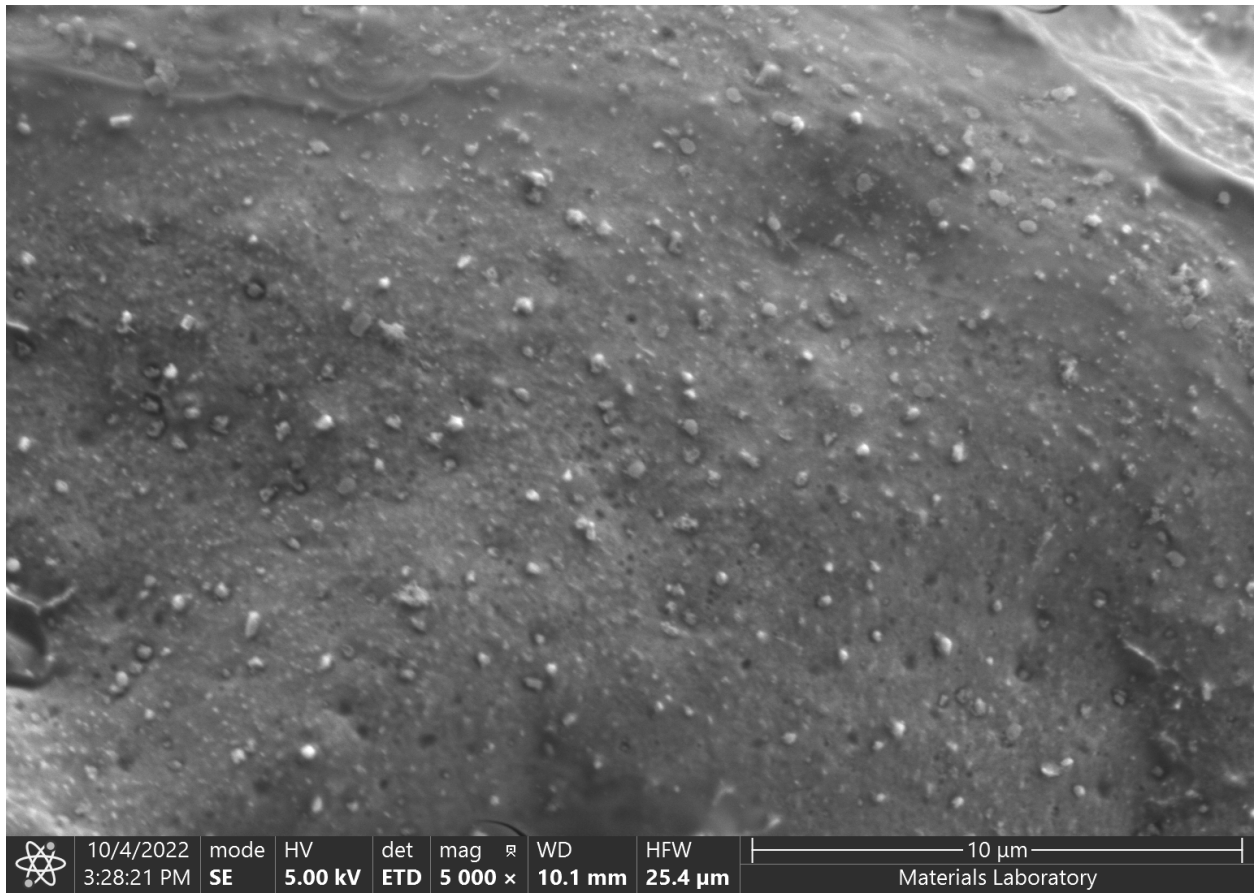


Figure 6. Secondary electron SEM photomicrograph of area A1 (See Figure 5). No fracture features were observed.

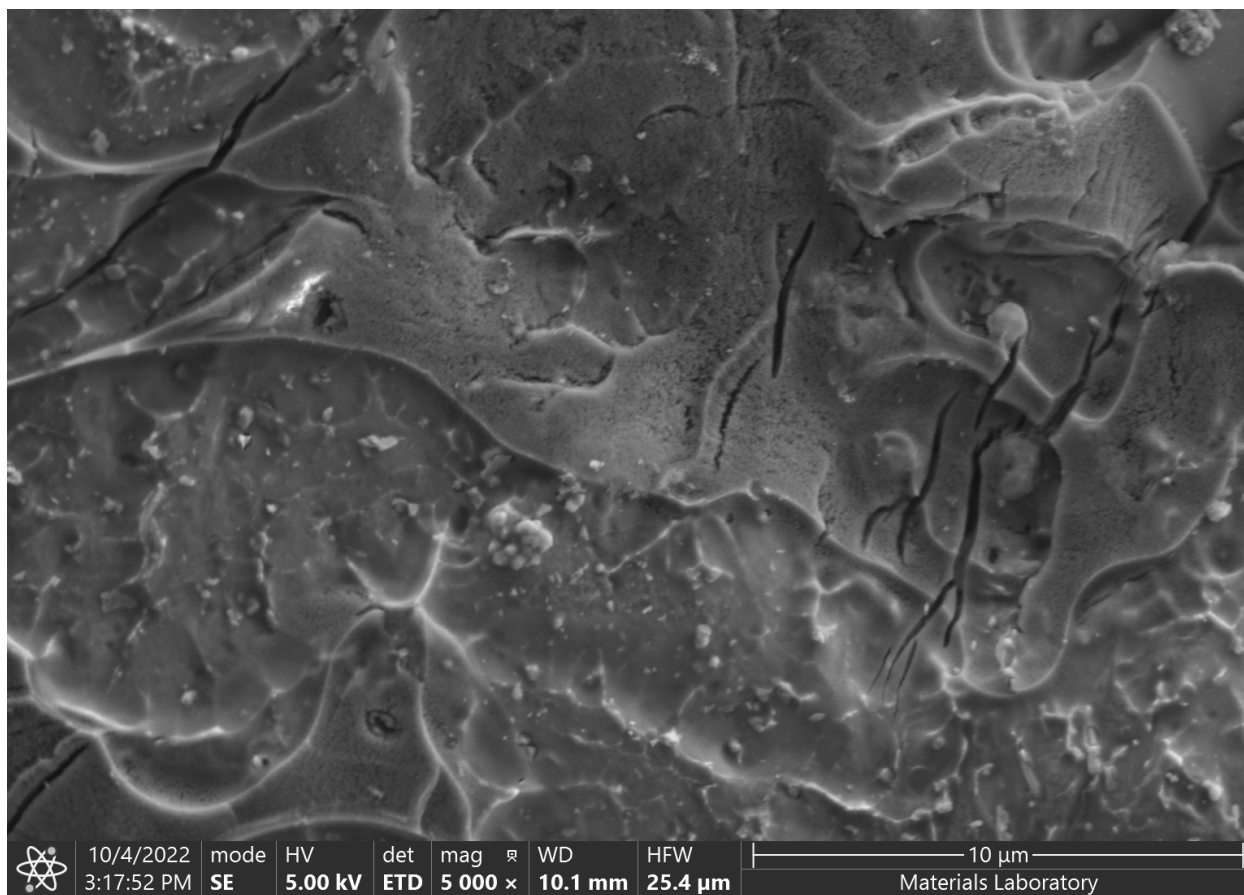


Figure 7. Secondary electron SEM photomicrograph of area A2 (See Figure 5). The fracture face is largely featureless with some ridges present.

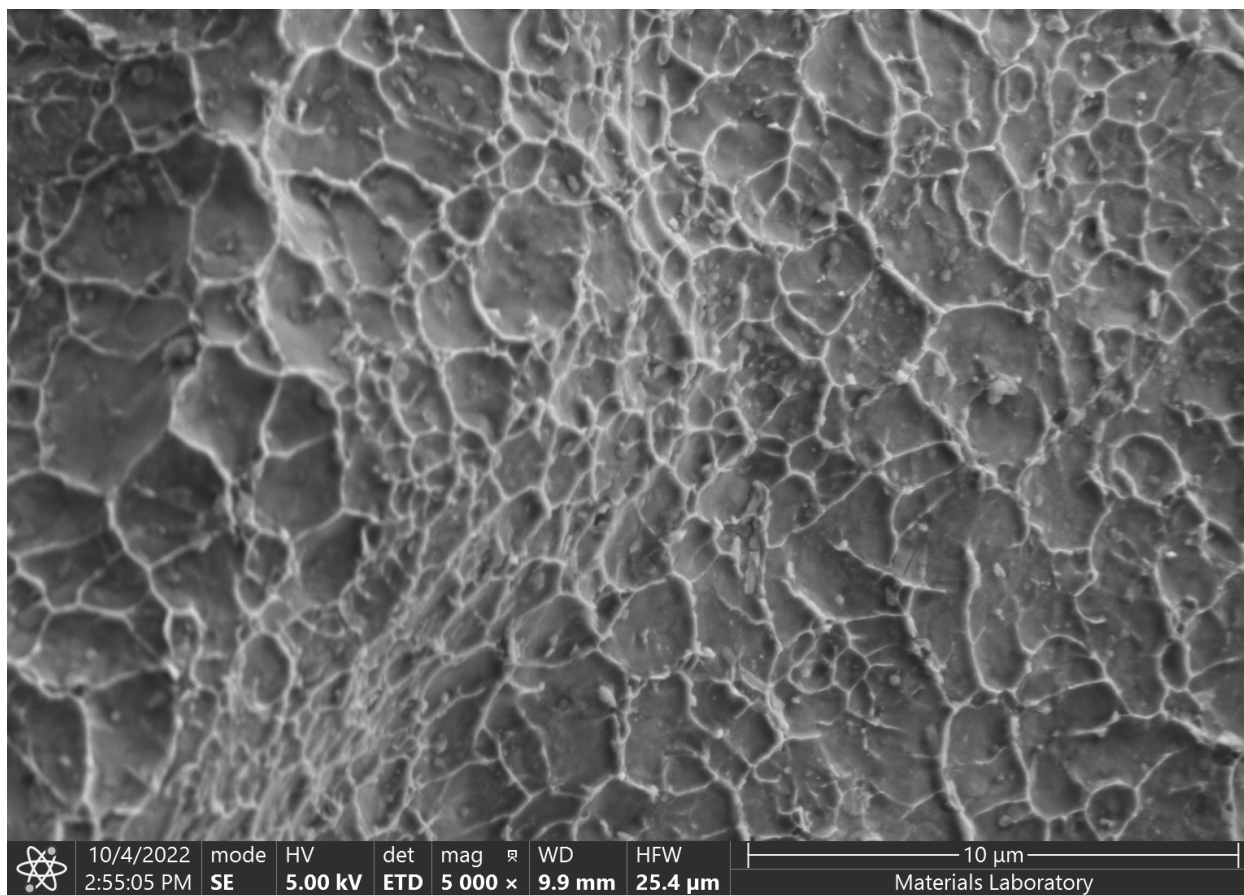


Figure 8. Secondary electron SEM photomicrographs of area A3 (See Figure 5). Dimple rupture features indicative of microvoid coalescence fracture are present across the field of view. Such features indicate ductile overstress fracture.

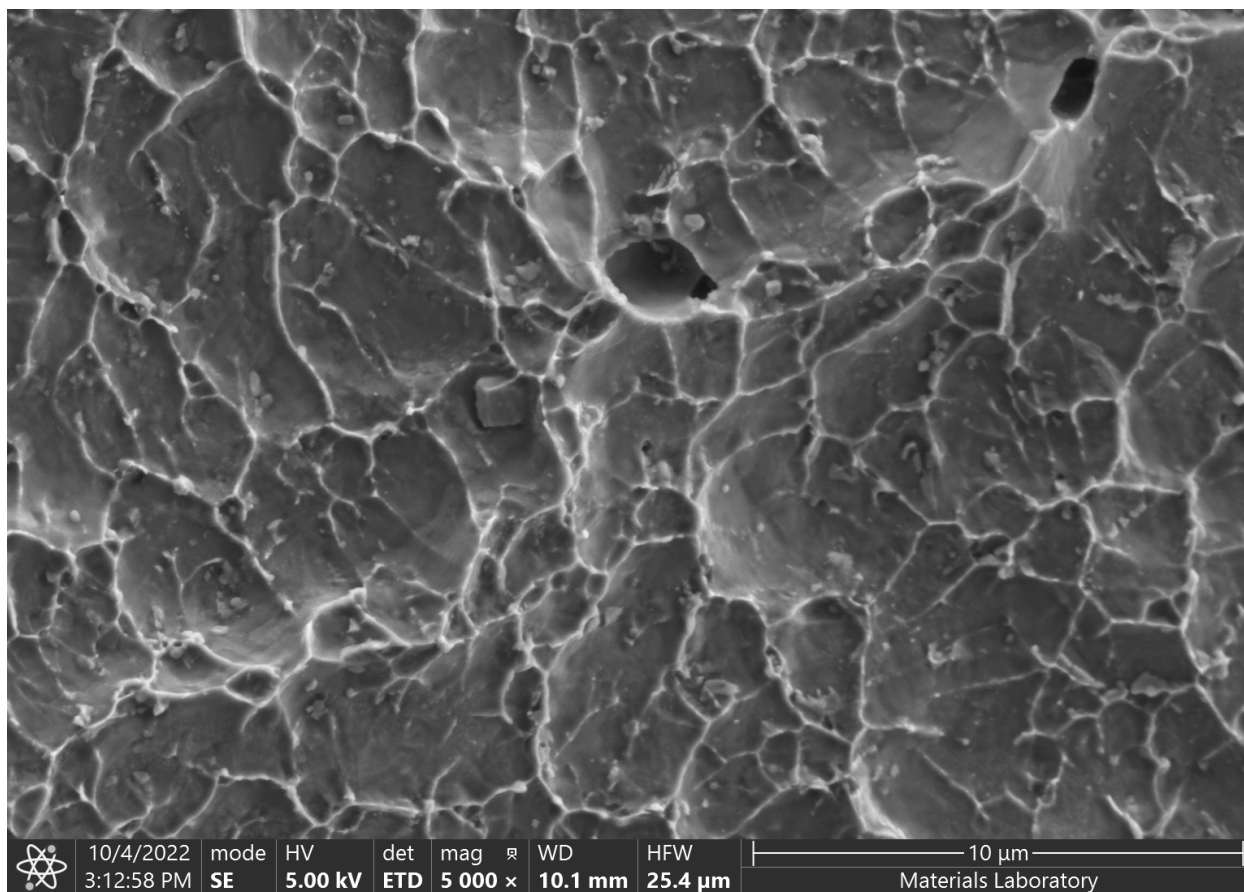


Figure 9. Secondary electron SEM photomicrographs of area A4 (See Figure 5). Dimple rupture features indicative of microvoid coalescence fracture are present across the field of view. Such features indicate ductile overstress fracture.

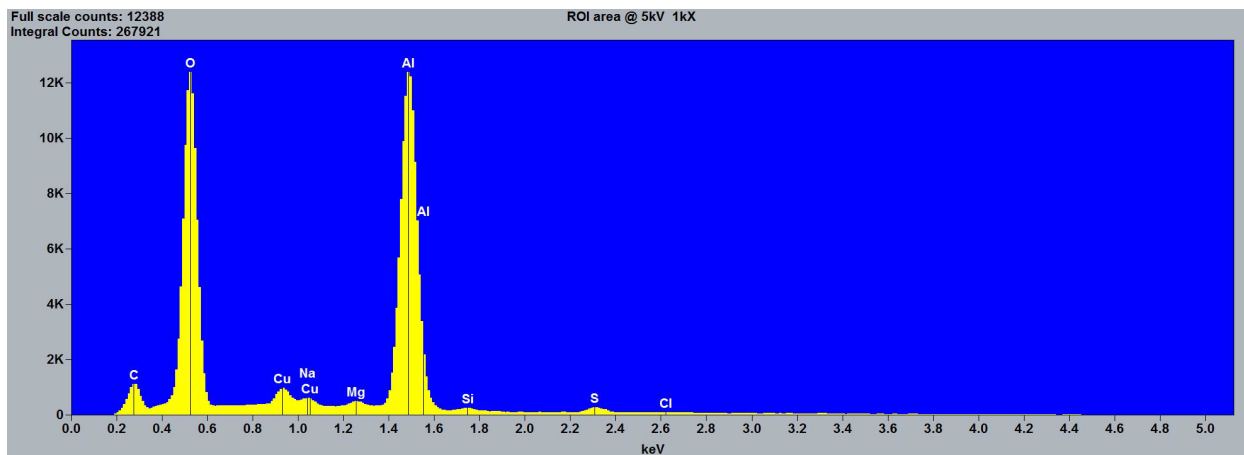


Figure 10. EDS spectrum from area A1.

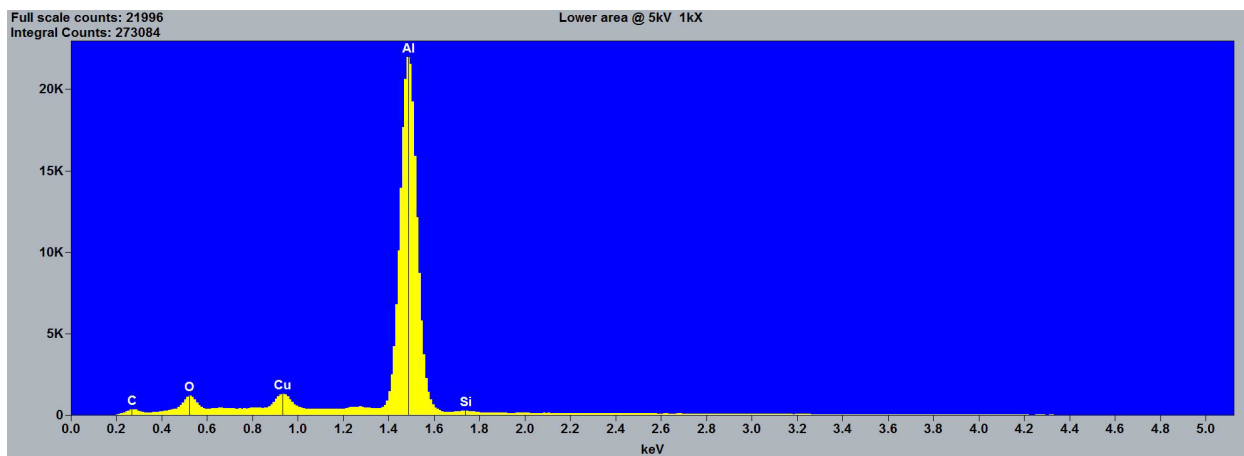


Figure 11. EDS spectrum from area A4.