



Ebatco will exhibit in several regional and national conferences and exhibitions to keep pace with market needs, and to meet and greet our existing and potential customers. Events include the following:

- November 16-20 – ISTFA, Booth #408, Pasadena Convention Center, Pasadena, CA
- April 25-30, 2026 – TechCon – The Society of Vacuum Coaters, Long Beach, CA.
Dr. Dehua Yang, as a cochair, is organizing a new session on: Characterization, Testing and Failure Analysis of Thin Films, Coatings, and Engineered Surfaces

If you are attending any of these events, please come and visit us to discuss how Ebatco could support you on your unmet analytical and testing needs!

Ebatco

**EBATCO ACADEMY TECHA (TESTING,
CHARACTERIZATION AND ANALYSIS)
WEBINAR SERIES**

Ebatco's Senior Materials Scientist, Dr. Lawrence Anderson, will present a webinar titled: **Failure Analysis in Metallic Materials and Coatings**

When: November 11, 2025, 10:00 – 11:00
AM CT

Where: Online Webinar

Cost: Free

Sign Up:

<https://www.ebatco.com/resources/ebatco-academy/ebatco-academy-techa-webinar-registration/>

*Registration closes November 9, 2025, 11:59
PM CT*

Attendees will get exposure to aspects of failure analysis related to fracture surfaces, microstructure evaluation, film delamination characterization, and chemical analysis to investigate failure modes and determine failure root causes. Failure analysis is key to product development, litigation decision making, and to improving next-generation designs. Topics to be covered may include the following:

Fracture
Contamination
Corrosion
Delamination
Adhesion

Surface
Microstructure
Steel Alloys
Composition
Strength

Case

Study

Fracture Failure Analysis of Steel Wire

Failure analysis is of utmost importance in many industrial applications, such as semiconductor, packaging, transportation, manufacturing and biomedical devices. Knowing how and why a material failed is essential to ensuring a product's reliability. Scanning Electron Microscopy (SEM) is one of the most powerful tools in failure analysis. By revealing the information about the microstructure at the fracture surface, one can derive lots of information about the failure mechanisms.

Material failure below its yield stress limit is often called fatigue failure. It occurs when the sample undergoes cyclic loading. Local microscopic cracks may develop at a certain stress threshold below its yield strength. Over a period of time, these cracks propagate, coalesce and eventually cause a fracture. A typical metal fatigue failure develops in three stages: crack initiation, crack propagation and final fracture. Each stage has its own characteristic morphology. The crack initiation site is located at the most stress-concentrated areas. The crack propagation shows typical striation lines, perpendicular to the direction of crack propagation and formed by each loading cycle. The final fracture area is the rapid fracture region, which typically shows a rough fracture surface. A dependable design against fatigue-failure requires thorough understanding on the failure mechanisms and knowledge in structural engineering, mechanical engineering, and materials science and engineering.

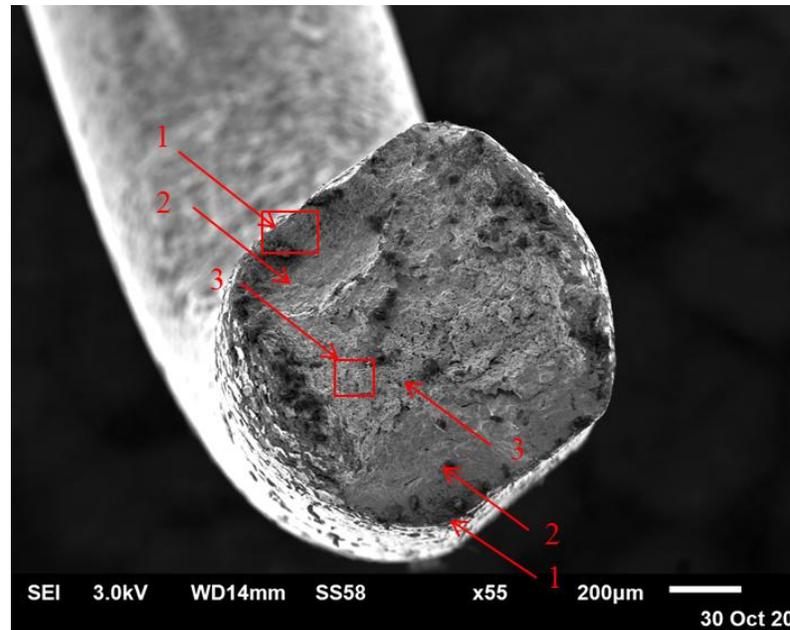


Figure 1. Scanning Electron Microscopy (SEM) image of a fractured steel wire.

Figure 1 illustrates an SEM image obtained by Ebatco NAT Lab's JEOL 6610LV for fracture

failure analysis of a steel wire failed under cyclic loading. Bending of the wire back and forth has caused both sides of the wire to undergo compression and tension forces, and the final wire rupture. Arrows marked with 1, 2 and 3 indicate the typical three stages of fatigue failure. Arrows marked with 1 indicate crack initiation regions. Arrows marked with 2 indicate crack propagation regions. Arrows marked with 3 are the final fracture regions.

Figure 2 presents higher magnification images of the red rectangles shown in Figure 1. The image below at left shows the area close to the crack initiation region. In this image, the striations as typical fatigue characteristics caused by crack propagation can be easily seen. The image below at right illustrates typical dimple structures from ductile fracture in the final fracture region. The dimples are formed due to high local plastic deformation at final rupture of the wire.

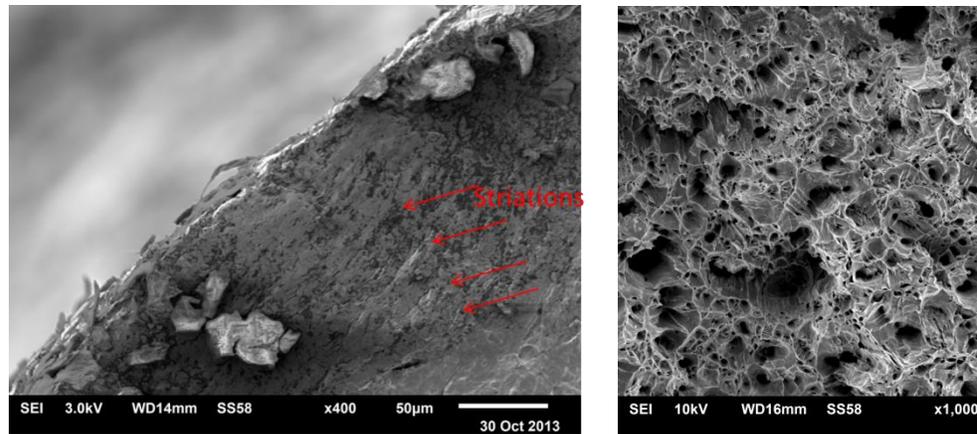


Figure 2. Enlarged fracture areas from Figure 1; left image, rectangular 1; right image, rectangular 3.

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