Ebatco Nano
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Nano Brief

A recent study by the North Carolina State University and the University of Minnesota found that people favor the labeling of food products that have been enhanced by nanotechnology in not only the food itself, but the packaging materials as well. The study does not indicate that people are for or against nanotechnology in food, they just want labeling and thus access to the information on the risks that may be associated with the involvement of nanotechnology. What is your opinion on the labeling of nanotechnology aided products?

Ebatco

In response to the increasing customer base from biomedical and pharmaceutical industries, we have decided to accelerate our ISO and FDA registration processes for our contract lab services. The decision reflects our continuing commitment to our customers, customer's needs and customer's satisfaction. We realize that the registration and fully compliance with ISO and FDA requirements for analytical and testing lab will take a significant amount of time and efforts to fully implement. We are ambitiously looking forward to its completion within one year.

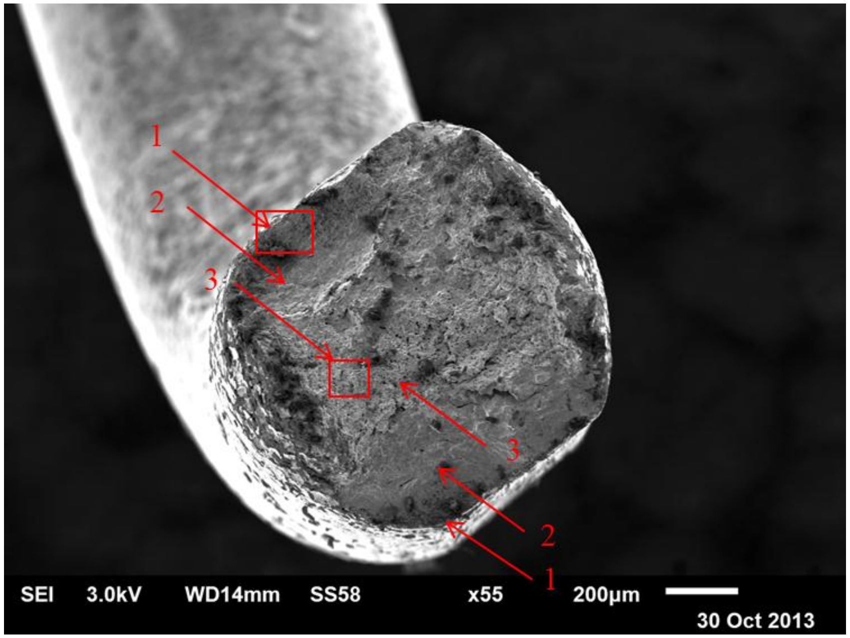
We have also supplemented our current testing capabilities by acquiring a centrifuge and carbon/metal sputter coater. Our centrifuge is an LW Instruments Combo V24 capable of reaching maximum speeds of 12,000 rpm. The Combo V24 will expand our existing liquid testing techniques such as particle size and liquid surface tension by providing the capability of liquid processing and particle separation. Our carbon/metal sputter coater is an Electron Microscopy Sciences EMS150R ES, which is capable of carbon fiber coating and metal sputter coating of samples. This coater will facilitate our SEM/EDS system to analyze samples that are non-conductive or are electron beam sensitive.

Combo V24 centrifuge (left) and EMS150R ES coater (right).

Case Study

Failure analysis is of utmost importance in many industrial applications, such as semi-conductor, 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 possible failure mechanisms.

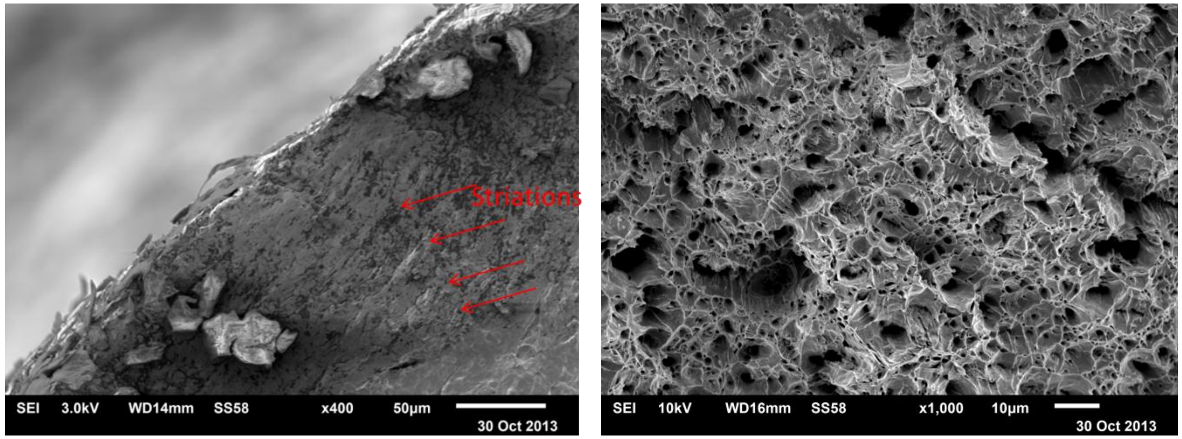
Material failure below its yield stress limit is often called fatigue failure. It occurs when a material undergoes cyclic loading. Local microscopic cracks may develop at a certain stress threshold below its yield strength. Over a period of time, these cracks propagate, coalescence and eventually cause a fracture. A typical metal fatigue failure develops in three stages: crack initiation, crack propagation and final fracture. Each stage has its own characteristic morphologies. 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.



SEM image of the fatigue failure of a steel wire.

The above SEM image was obtained by Ebatco NAT Lab's JEOL 6610LV for fracture failure analysis of a steel wire failed under cyclic loading. Arrows marked by 1, 2 and 3 indicate the typical three stages of fatigue failure. Bending of the wire back and forth has caused both sides of the wire to undergo compression and tension forces. Arrows marked with 1 indicate crack initiation regions. Arrows marked with 2 indicate crack propagation regions. Finally, arrows marked with 3 are the final fracture regions.

The below images show the red rectangles next to corresponding arrows in the image above at higher magnifications. The image below at left shows the area close to the crack initiation region. The striations as typical fatigue characteristics during crack propagation can be easily seen. The image below at right illustrates typical dimple structures from ductile fracture in the final fracture region.



Enlarged fracture areas from the above image. The image at left shows the rectangular area indicated by arrow 1, while the image at right shows rectangular area indicated by arrow 3.

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