APPLICATION NOTE

LAXOR

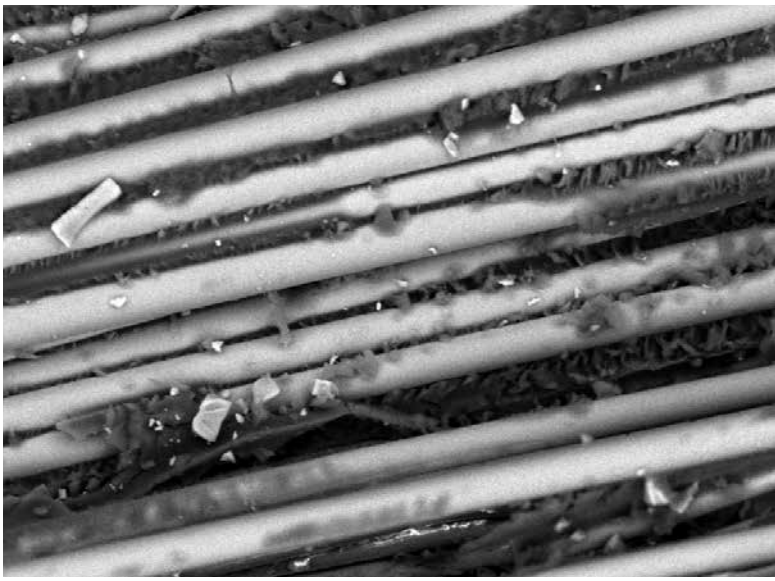
Glass fibers

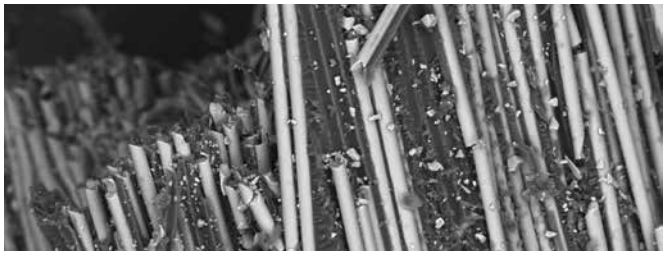
Glass fibers

Glass fiber is a material consisting of numerous extremely fine fibers of glass, typically with diameters of 3 µm up to 20 µm. Glass fibers are used in combination with polymers to obtain a reinforced plastic.

Glass-reinforced polymer is a composite material or fiber-reinforced plastic made of a plastic reinforced by fine glass fibers. As with many other composite materials, the two materials act together, each overcoming the deficits of the other.

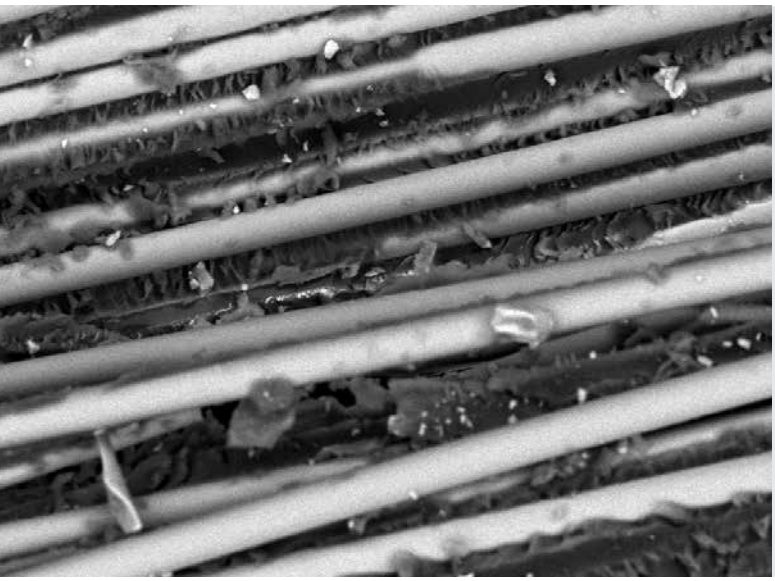
Whereas the plastic resins are strong in compressive loading and relatively weak in tensile strength, the glass fibers are very strong in tension but tend not to resist compression. By combining the two materials, Glass-reinforced polymer becomes a material that resists both compressive and tensile forces well.





According to the use, the glass fibers can be made of different types of glass. Uses for regular glass fiber include mats and fabrics for thermal insulation, electrical insulation, sound insulation, high-strength fabrics or heat- and corrosion-resistant fabrics.

It is also used to reinforce various materials, such as tent poles, translucent roofing panels, automobile bodies, boat hulls, and paper honeycomb.



Why is SEM imaging used to study glass fibers?

SEM imaging is an ideal tool to check the homogeneity and dispersion of glass fibers in a polymer matrix. Other defects such as poor adhesion of the fibers to the polymer matrix (shown as clean fibers) can also easily be detected. Chemical microanalysis techniques (EDS) used in conjunction with scanning electron microscopy offers additional information about the composition of the fibers.

As already mentioned, glass fibers and a lot of polymers are good thermal and electrical insulators. This means that when they are scanned by the electron beam in a microscope, sample charging will often occur.

What is sample charging?

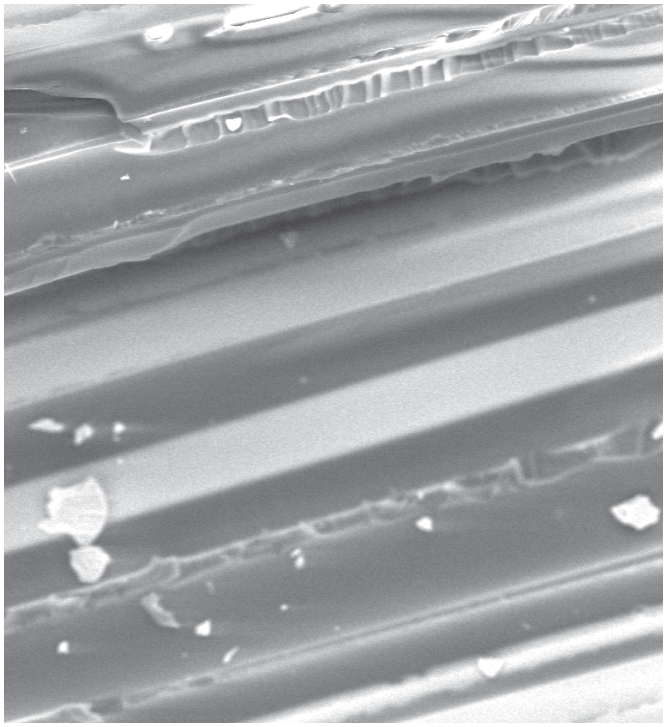
SEM images are generated by scanning an electron beam across the sample. This effectively adds electrons to the sample. Sample charging occurs when samples are bad electrical conductors which means there is no conducting path for electrons to flow from the sample surface towards the sample holder. Sample charging causes all kinds of problems such as drift, blur, and low contrast. In other words, blurry and false images.

By applying a very thin electrically conducting layer of metal such as gold or platinum (a process known as metal coating or sputter coating) onto the surface topography of the specimen, the electrons can flow from the sample surface towards the sample holder and sample charging is prevented. Other positive effects from sputter coating a sample are an improved secondary electron emission, a reduced beam penetration with improved edge resolution and a better protection of electron beam sensitive samples.

Luxor metal coaters are designed to automatically apply a homogeneous and thin metal layer to your SEM samples, protecting them from any charging effects and enhancing the image resolution in your electron microscope.

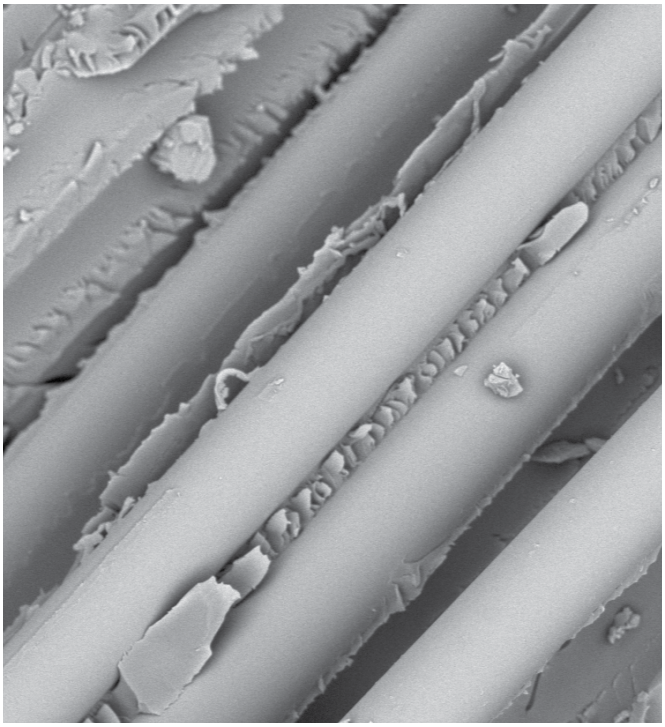
Glass fiber uncoated

2.000x magnification



Glass fiber coated

10 nm gold layer - 2.000x magnification



Why choose LUXOR?

A² technology: precision coating for high-resolution imaging

LUXOR's unique and innovative A² technology generates a plasma with exceptional precision and control, resulting in a uniformly thin and homogeneous coating. This process begins by creating a vacuum in the chamber, followed by the application of a high voltage. To ensure stability, the resulting coating current is automatically regulated by introducing small amounts of process gas into the reactor, allowing the target current to be reached and maintained.

What distinguishes LUXOR metal coaters from other commercially available instruments is the unique method used to control and adjust this process. For scanning electron microscope (SEM) operators, this means obtaining more consistent and uniform metal coatings, which significantly enhance image quality with higher resolution and contrast. Additionally, the coating process is fully automated, removing the need for manual intervention and allowing for a seamless and worry-free experience.

Innovative upside-down design for greater functionality

At LUXOR, we adhere to a 'form follows function' philosophy, which is why our metal coaters feature a unique design where the samples and target are mounted upside down. While this may seem unconventional at first, it offers several significant advantages.

- **Safety first**
  All voltage and current wires are securely housed within the sputter device, significantly reducing the risk of electric shocks. This safety feature allows you to operate the machine with complete peace of mind.

- **Effortless sample handling**
  The upside-down design makes the lid, which doubles as a sample loading station, easily accessible. This allows you to apply or remove samples quickly, without the need for special tongs or tweezers. This simplicity not only enhances ease of use but also boosts productivity by streamlining the process.

- **Clean coating process**
  This design ensures that loose particles are removed during the coating process, helping to keep your Scanning Electron Microscope (SEM) optimally protected from debris. Consequently, this contributes to more consistent and reliable results.

- **3D coating**
  Additionally, larger particles in the plasma are drawn towards the pump rather than reaching the samples due to their weight, resulting in improved coating quality. This effect, combined with the algorithms of our A² technology, eliminates the need for a rotary or planetary table, greatly simplifying the setup for coating three-dimensional and porous samples.

Fully automated
The coating process is completely automated. Once the samples are loaded, simply select the desired coating thickness and press the start button. This user-friendly system greatly reduces the likelihood of human errors. New operators and lab personnel can learn to operate the device within just a few minutes of basic training.

In our E-BOOK "INTRODUCTION TO METAL COATING TECHNOLOGY FOR ELECTRON MICROSCOPY" you can learn more about sample charging, ways to avoid it, and all there is to know about sputter coating.

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