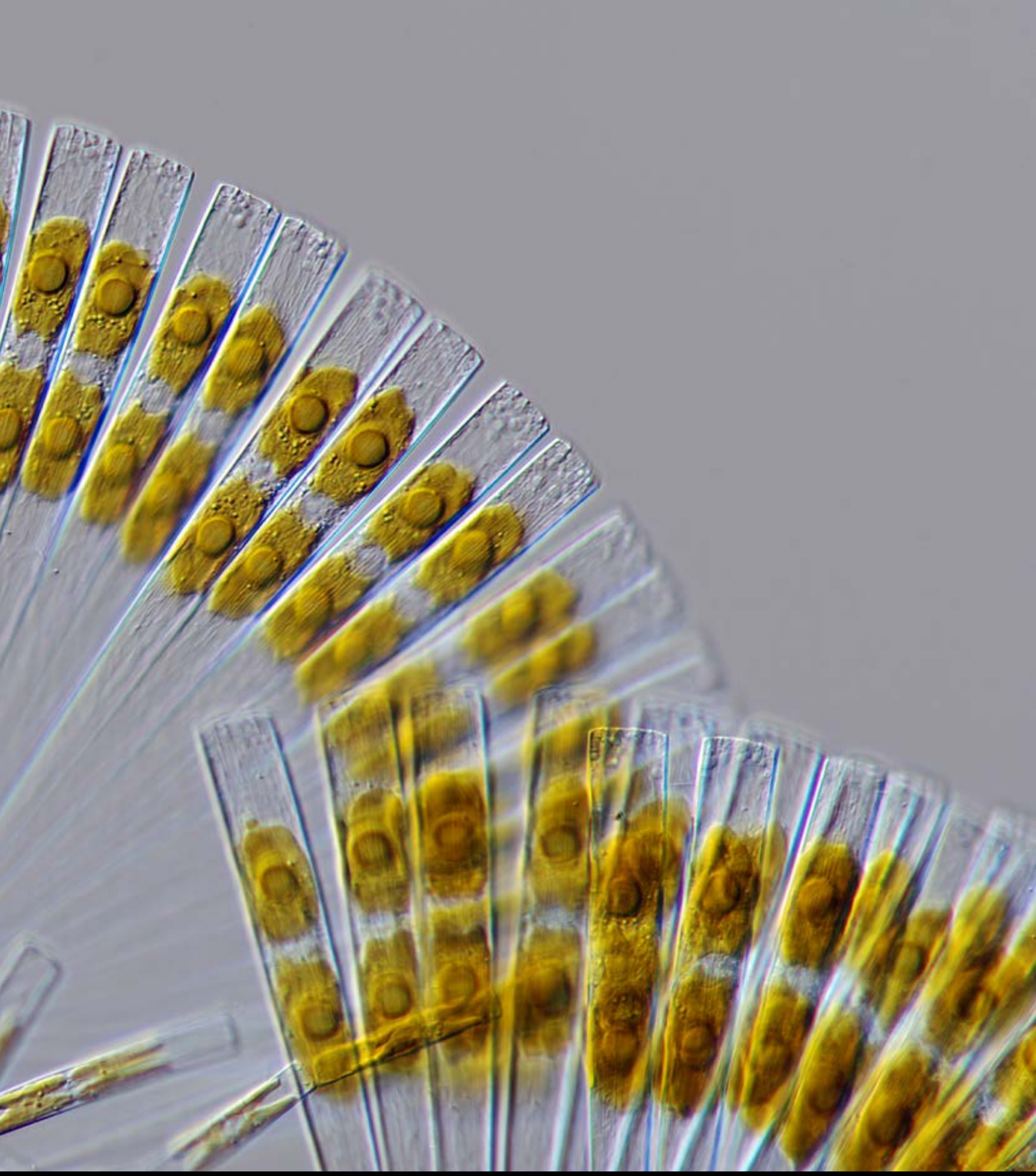
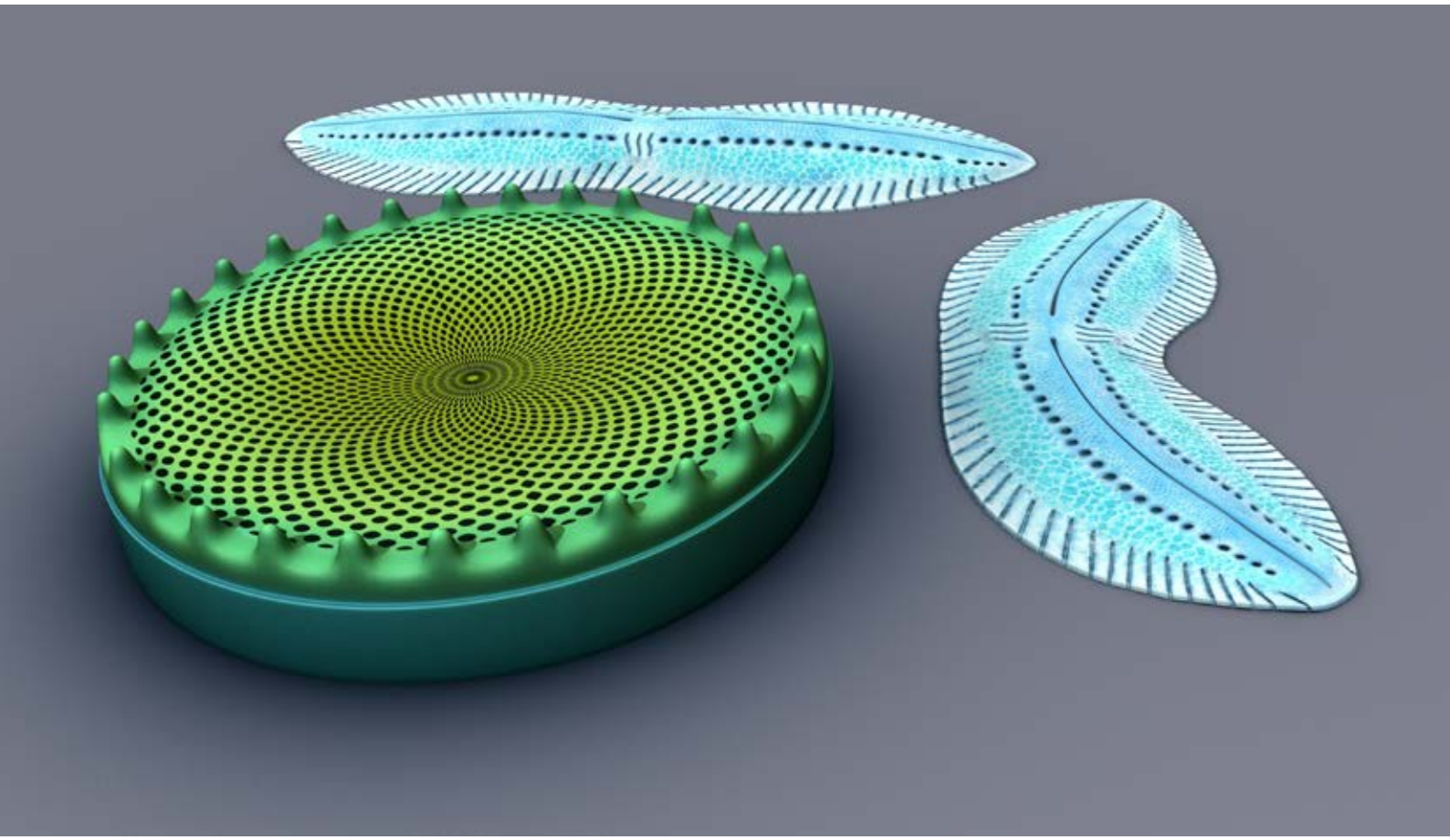


APPLICATION NOTE

LAXOR

Diatoms



Diatoms

Diatoms are a major group of microalgae, found in oceans, waterways and soils of the world. Living diatoms generate about 20 to 50 percent of the oxygen produced on the planet each year, take in over 6.7 billion metric tons of silicon each year from the waters in which they live, and constitute nearly half of the organic material found in the oceans.

Diatoms are unicellular. They occur either as solitary cells or in colonies, which can take the shape of ribbons, fans, zigzags, or stars. Individual cells range in size from 2 to 200 micrometres.

A unique feature of diatom anatomy is that they are surrounded by a cell wall made of silica. Similar to plants, diatoms convert light energy to chemical energy by photosynthesis.

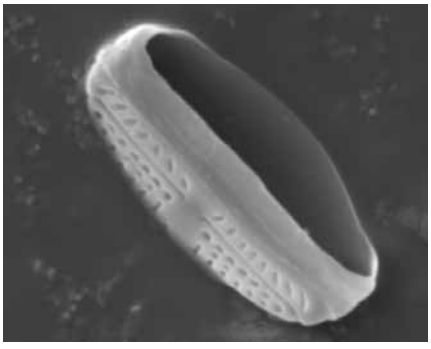
Diatomaceous earth (diatomite) is a collection of diatom shells found in the earth's crust. They are soft, silica-containing sedimentary rocks which are easily crumbled into a fine powder and typically have a particle size of 10 to 200 µm. Diatomaceous earth is used for a variety of purposes including for water filtration, as a mild abrasive, in cat litter, and as a dynamite stabiliser.

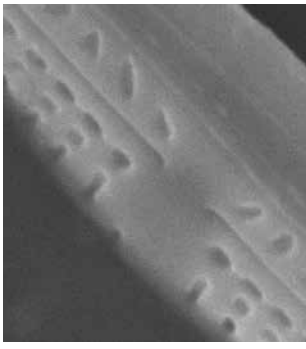
Why is SEM imaging used to study diatoms?

Diatoms are used to help determine the origin of materials containing them. One important field of use is forensics. A typical application is to differentiate a death by submersion from a post-mortem immersion of a body in water. Because the composition of diatoms is specific for a specific location, a sample of diatoms can point to a specific site.

Diatoms are also used to monitor past and present environmental conditions, and are commonly used in studies of water quality.

The deposition of silica by diatoms may also prove to be of utility to nanotechnology. With an appropriate selection procedure, diatoms of particular shapes and sizes might be used to mass-produce nanoscale components. For all these applications SEM imaging is used to determine the shape, size and composition of a diatom sample.





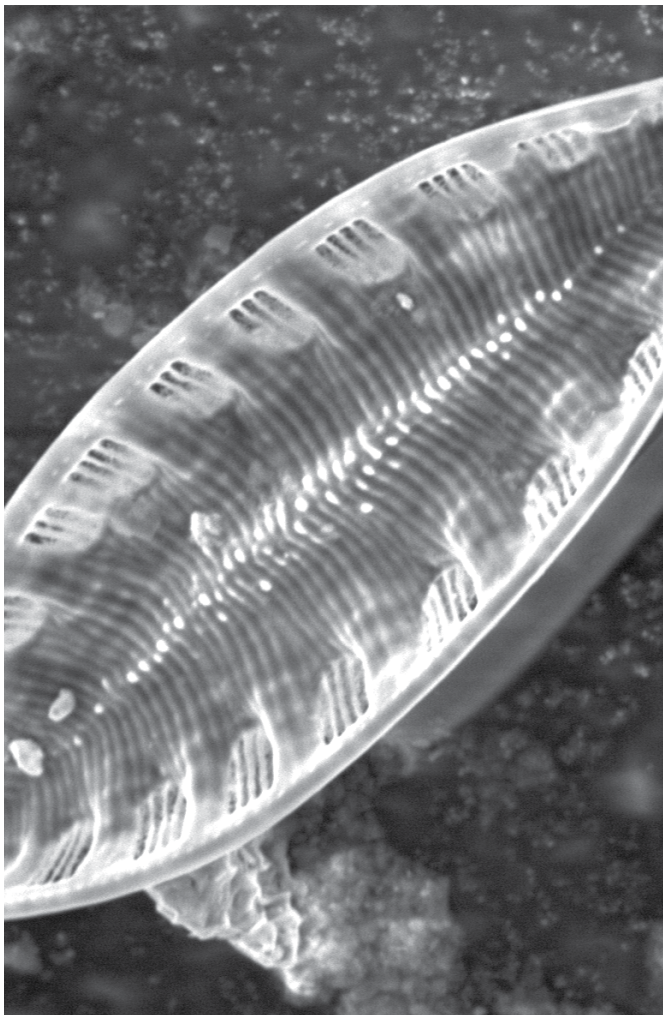
What is sample charging?

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. The top image on the left (of right…?) shows the moderate charging effect of an uncoated diatom sample at 10 000X magnification. The bottom image is the same sample but coated with a 7 nm gold layer.

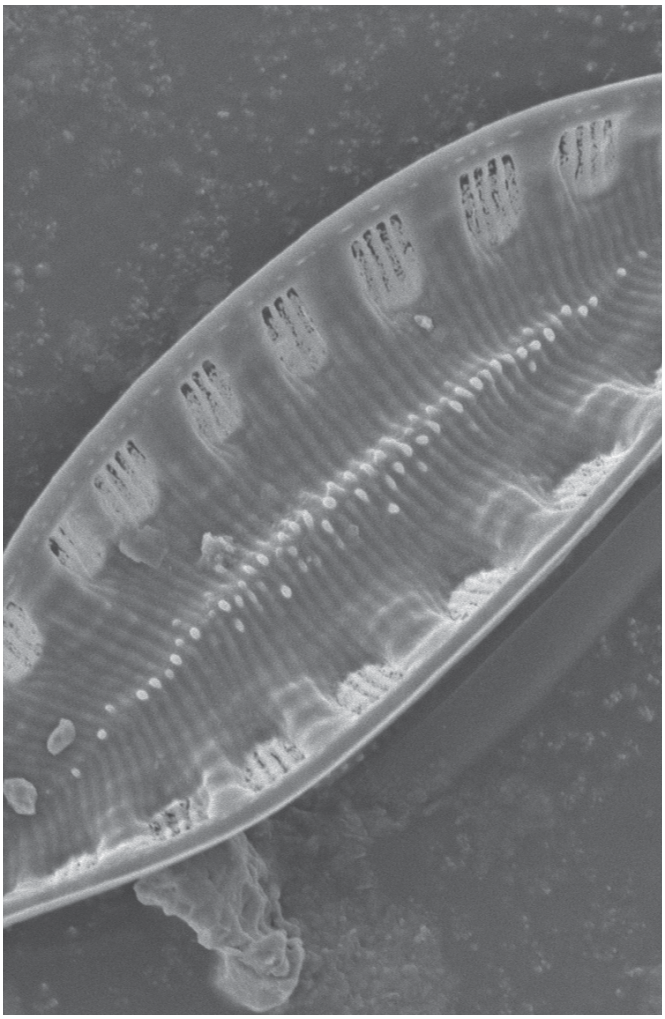
Diatom uncoated

10.000x magnification



Diatom coated

10.000x 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.

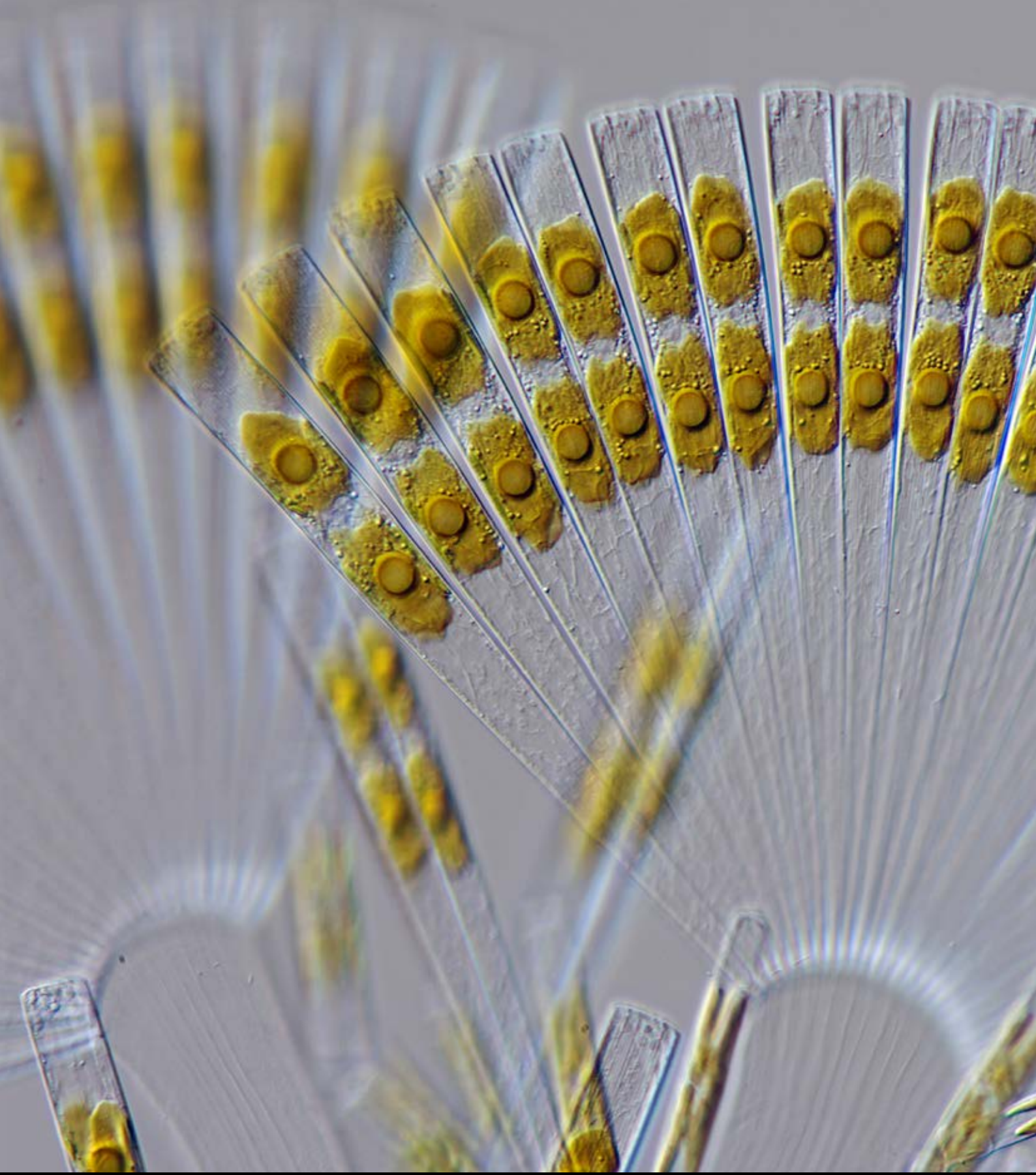
- **Clean coating process**
  This design ensures that loose particles are removed during the coating process, helping to keep your Scanning Electron Microscope (SEM) optimally protected from debris. Consequently, this contributes to more consistent and reliable results.

- **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.

Scan to visit our knowledge center
luxor-tech.com/knowledge-center-luxor



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