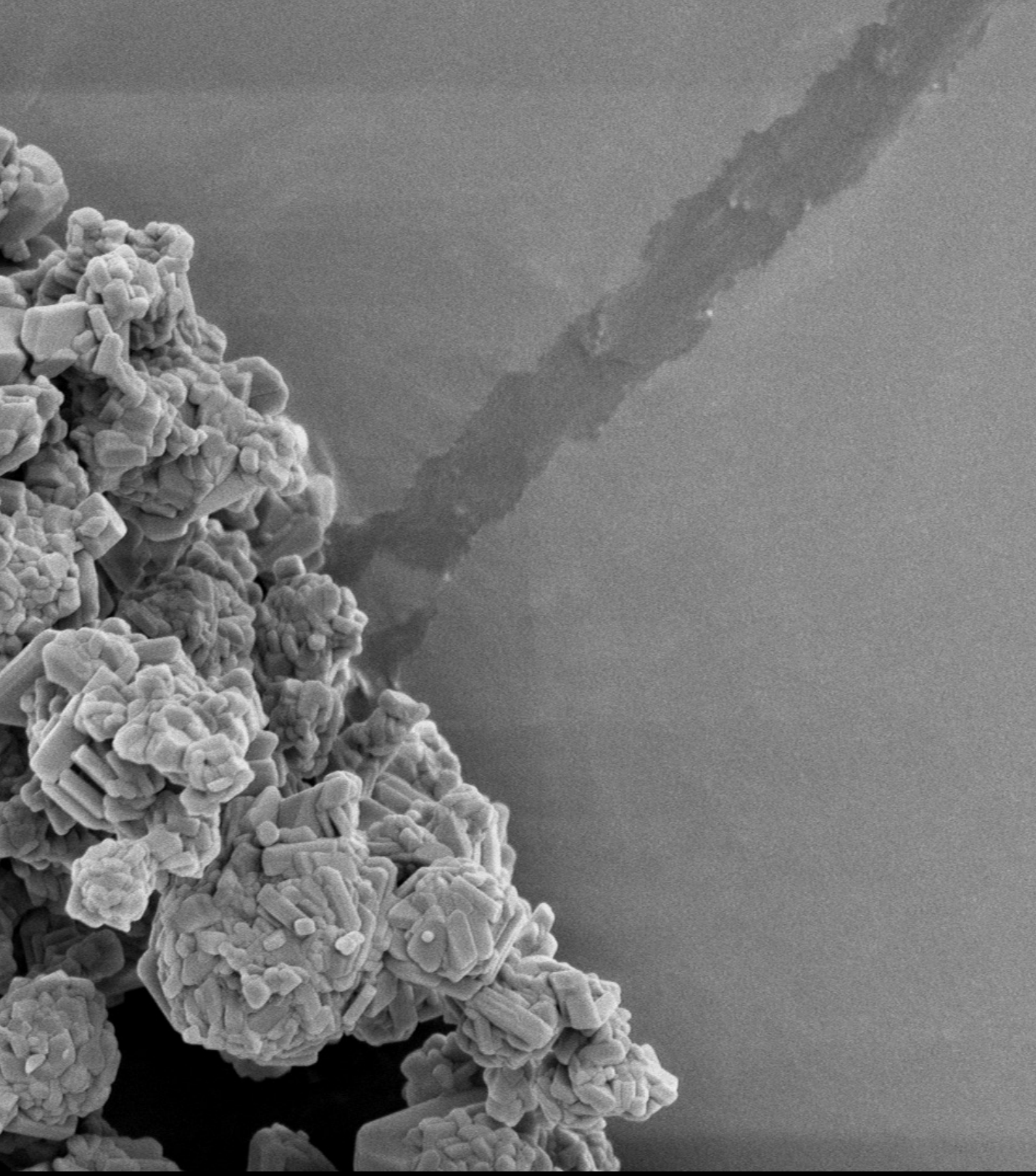


APPLICATION NOTE

About coating thickness and visual appearance

LAXOR

About coating thickness and visual appearance

Thin coatings consisting of materials such as gold or platinum that were applied via sputter coating do not always have the “metallic appearance” we are familiar with in everyday life. Gold or platinum coatings with layer thicknesses below 15 to 20 nm do not have the “gold appearance” or “platinum appearance” that one would expect.

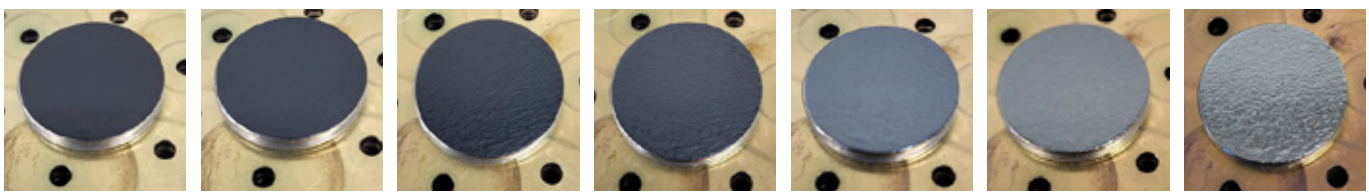
This is often interpreted by the operator of a sputter coater as if no or insufficient coating has been applied, while in fact the requested coating is present.

To address this common misunderstanding, LUXOR conducted a test in which layers of different thickness of gold and platinum were coated on a stub with carbon tape. These are the results:

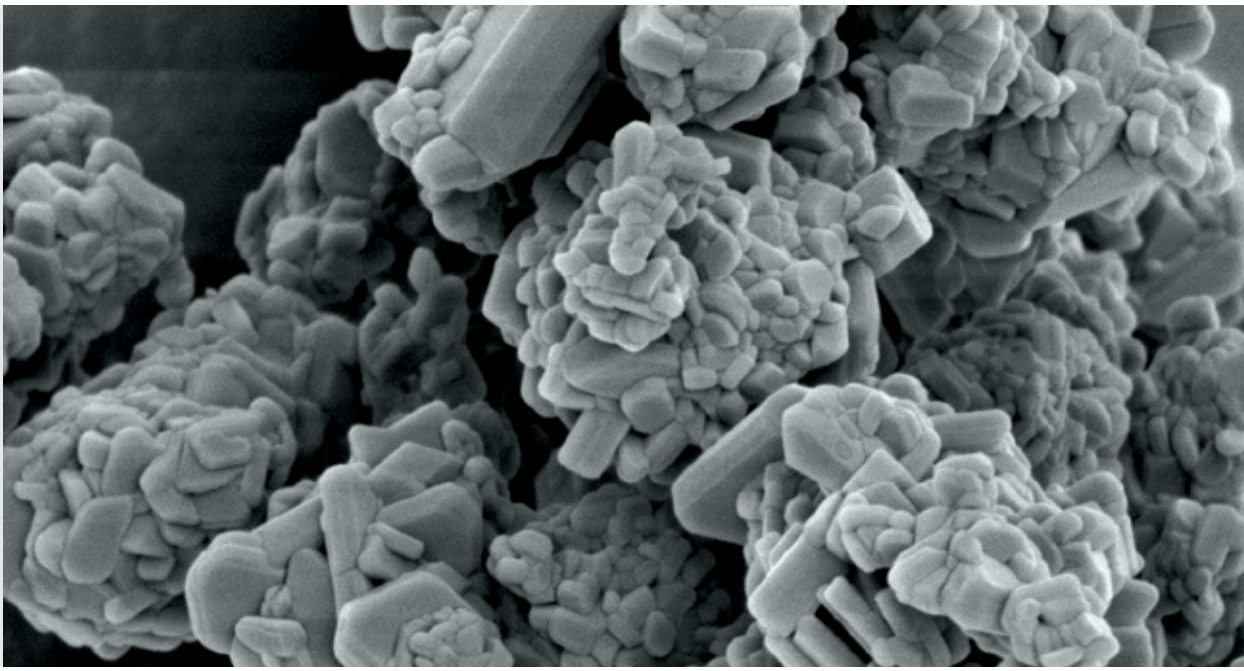
Gold

0 nm | 5 nm | 10 nm | 15 nm | 20 nm | 25 nm | 30 nm

Platinum



0 nm | 2 nm | 4 nm | 8 nm | 10 nm | 20 nm | 30 nm



It is clear that the typical gold or platinum appearance only becomes visible for layers with a thickness above 20nm. Thinner layer thicknesses visually show only a somewhat reflective or grayish appearance. By elemental analysis in the electron microscope using EDS, it becomes clear that a gold or platinum layer is indeed present.

From a practical point of view it is important to note that, if you notice a clear gold or platinum layer on your coated sample, it is more than likely that the applied coating is a lot thicker than the classic 2 nm to 5 nm for platinum or 5 nm to 10 nm for gold required to prevent charging for most materials. In that case, you should adjust your coater's parameters to coat thinner layers that leave the topography of the sample visible.

This sounds obvious, but when using manual coating systems, there is little or no control over the coating process parameters, often resulting in coatings that are too thick or not very homogeneous. In such cases, using the above images as a quick reference check can be very helpful in evaluating the quality and thickness of the applied coating.

What is sample charging?

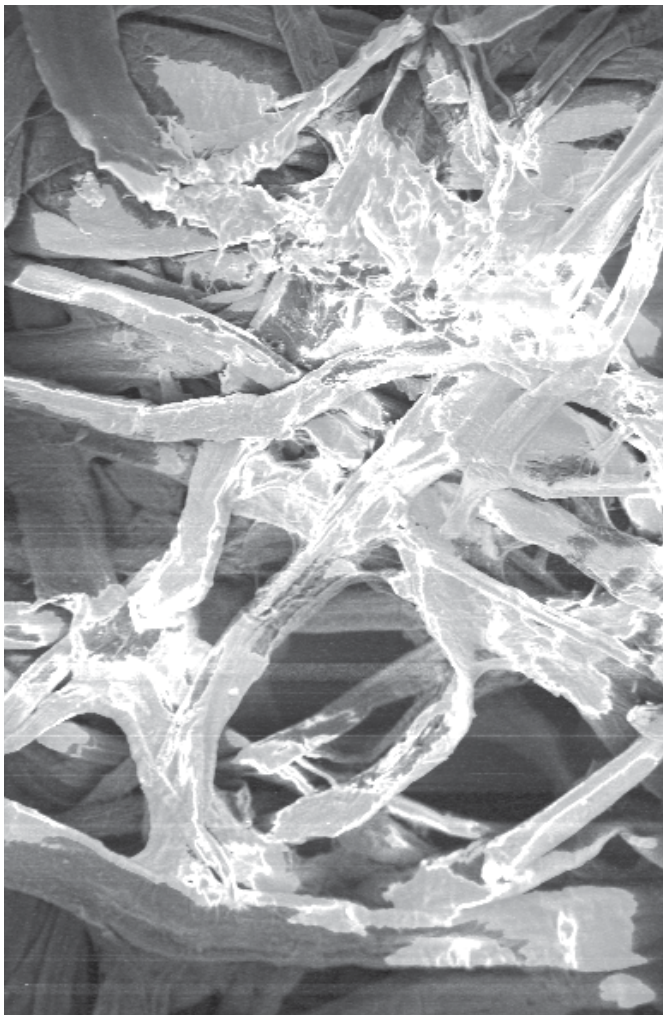
In an electron microscope, samples are placed in a vacuum chamber and exposed to an electron beam. Non-conductive or weakly conductive samples can become electrically charged during this process, leading to abnormal contrast and “overexposed” images.

This issue can be mitigated by applying a thin layer of a conductive material, typically gold, platinum, or carbon, to the sample’s surface. The most common methods for this coating include thermal evaporation for carbon and plasma sputter coating for gold and platinum. This preparation technique is commonly referred to as SEM coating.

Tissue paper

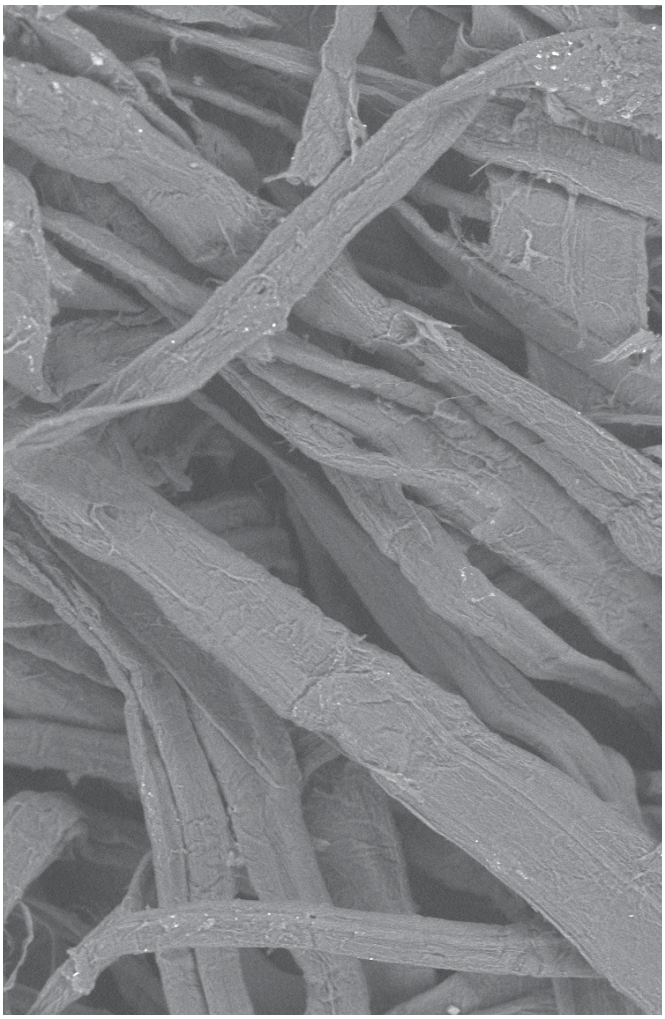
Tissue paper uncoated

1.000x magnification



Tissue paper coated

5 nm gold layer - 1.000x 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.

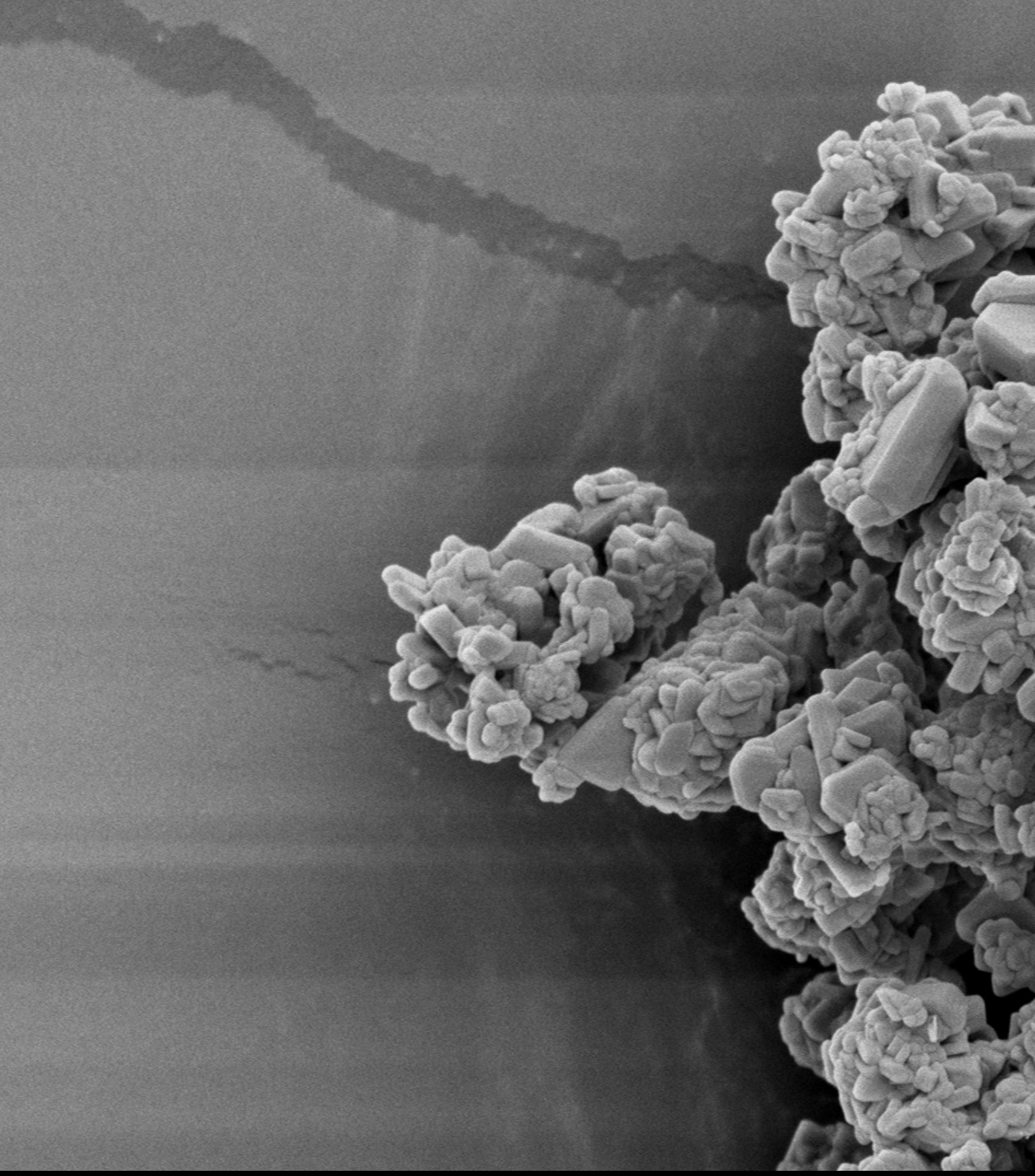
- **Clean coating process**
  This design ensures that loose particles are removed during the coating process, helping to keep your Scanning Electron Microscope (SEM) optimally protected from debris. Consequently, this contributes to more consistent and reliable results.

- **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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