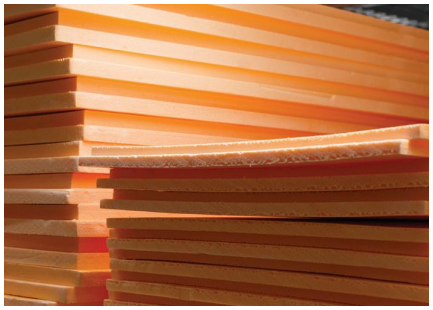
METAL COATING OF STYROFOAM (XPS) AND POLYSTYRENE FOAM (EPS) SAMPLES FOR ENHANCED SEM IMAGING

WHAT IS STYROFOAM?

Styrofoam is a trademarked brand of closed-cell extruded polystyrene foam (XPS), manufactured as insulation board used in walls, roofs, and foundations as thermal insulation and water barrier.

The name styrofoam is also used worldwide to refer to another material that is usually white in colour and made of expanded (not extruded) polystyrene foam (EPS). This material is often used in food containers, coffee cups, and as cushioning material in packaging. The trademarked term is used generically although it is a different material from the extruded polystyrene used for Styrofoam insulation.



WHERE IS IT USED?

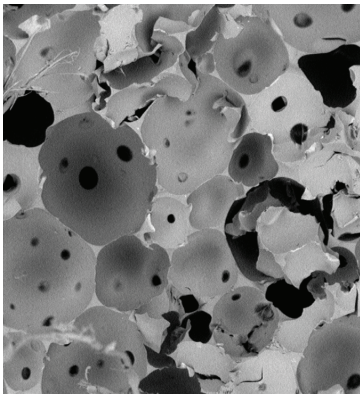
Polystyrene (PS) is used for producing disposable plastic cutlery and dinnerware, CD cases, plastic model assembly kits, and many other objects where a rigid, economical plastic is desired. Production methods include thermoforming (vacuum forming) and injection molding.

Polystyrene foams are 95-98% air. They are good thermal insulators and are therefore often used as building insulation materials. Thermal conductivity is a measure of the thermal insulation properties of EPS. Typical values range from 0.029 to 0.038 W/(m K) depending on the density of the board.

WHY IS SEM IMAGING USED TO STUDY STYROFOAM?

SEM imaging is an ideal tool to check the size and homogeneity of the cells in a polymer foam structure, and if the material has a closed or open cell structure. Other elements that can be studied are the foaming and cell formation efficiency, and how different agents influence these processes. Chemical microanalysis techniques (EDS) used in conjunction with scanning electron microscopy offers additional information about contaminants in the polymer foam.

Most polymer foams 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. The combination of a bad thermal conductor and thin cell walls can also cause degradation of the cell structure. Such samples are called “beam sensitive”, which means they can easily deform when scanned by an electron beam.



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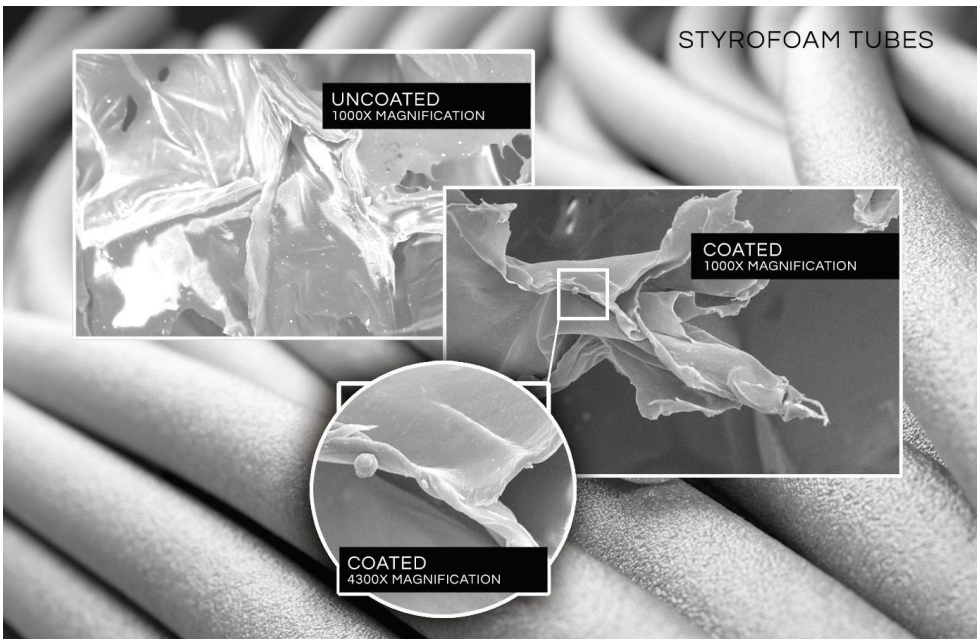
WHAT IS SAMPLE CHARGING?

What is sample charging and what are the effects of sample charging on SEM imaging, and what are the positive effects of metal sputter coating?

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.

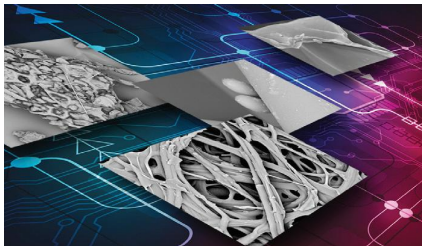


IMAGING AND COATING CONDITIONS

SEM images were recorded with a Thermo Scientific Phenom XL desktop electron microscope using the BS detector in high vacuum mode (1 Pa) at 10kV. A 10nm gold coating was applied using the LUXOR^{Au} metal coater.

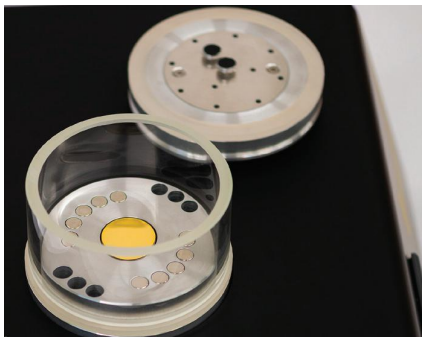
SPUTTER COATING WITH THE LUXOR METAL COATER

LUXOR metal coaters are used extensively in SEM and TEM labs worldwide where image quality and high resolution imaging are of the utmost importance. Metal sputter coating not only prevents sample charging, but also provides improved edge resolution and a better protection of electron beam sensitive samples. Even at relatively low magnifications sample coating offers additional security in a high throughput environment with multiple operators having to provide high quality images in a routine analysis environment on a large variety of samples.



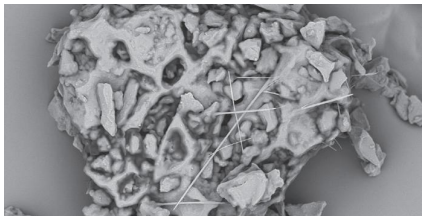
A² TECHNOLOGY

LUXOR's unique A² Technology generates a metal plasma and applies it in a controlled and accurate manner, resulting in an extremely uniform, thin and homogeneous metal layer. The unique way this process is controlled and adjusted is what distinguishes the LUXOR metal coaters from other commercially available instruments. For the SEM operator this means more homogeneous metal coatings, resulting in high resolution and high contrast images and a worry-free coating process without any manual intervention.



UPSIDE DOWN DESIGN

In the LUXOR metal coaters, the samples are mounted upside down. While this might seem a little controversial at first sight, it is actually a consequence of our 'form follows function' approach. In fact, the upside down architecture brings many advantages. First, all high voltage and high current wires are safely hidden within the instrument. This obviously greatly reduces the risk of electric hazards. Next, the sample loading station is easily accessible and allows to apply or remove the samples without the need for special tongs or tweezers. This doesn't just make everyday use easier, but also speeds up productivity. The upside design also makes sure that loose particles will be removed during the coating process. This way, your SEM is optimally protected.



FULL AUTOMATION

The coating process is fully automated. As soon as your samples are loaded into the preparation station, you only have to choose the desired coating thickness and push the start button. Thanks to this user friendly process, the chance of human errors is significantly reduced. Furthermore, this means that untrained operators and lab personnel can operate the device.

Distribution in the UK & Ireland

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