

CorrStub™ - Agar SEM stub for correlative microscopy and forensic GSR analysis

Technical Note

Analysis and characterisation of organic and non-organic samples can involve the collection of images and data using a variety of instruments and techniques and, in most cases, the use of a single analytical approach is unable to provide all of the answers required.

For example, Focused Ion Beam-SEM (FIB-SEM) with Energy Dispersive X-ray Spectroscopy (EDS) can provide elemental analysis information; crystalline structure and composition can be determined using Electron backscatter diffraction (EBSD) and Cathodoluminescence (CL) and temperature controlled stages can enable the study of real-time behavioural changes in the phases and structure of materials across a range of temperatures. However, simple information such as sample colour cannot be determined in conjunction with the many tools available in EM.

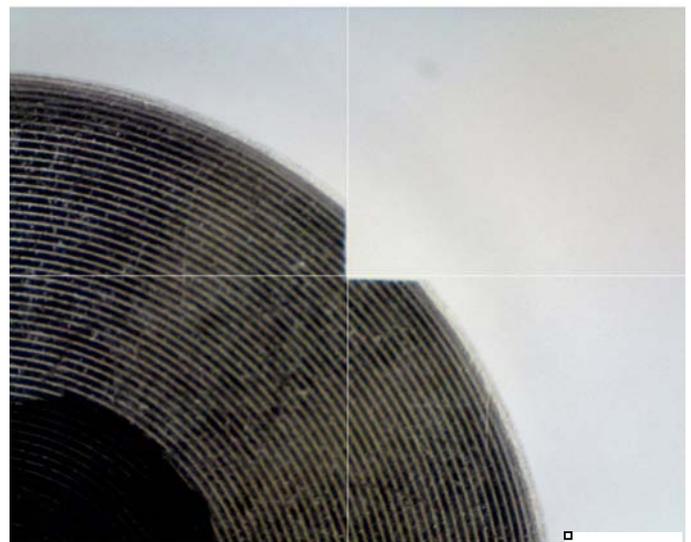


Fig.1

Ideally, determining the complete characterisation and analysis for the same area of interest in a single sample would be achieved using complementary approaches such as X-ray diffraction and light microscopy.

With this concept in mind, Agar Scientific have developed a new sample support that can be customised for a variety of FIB-SEM applications but can also be used in conjunction with other analytical approaches including light microscopy.

The CorrStub™ SEM specimen stub allows the user to determine the precise location of an area of interest across a number of compatible imaging and analysis platforms. For example, a specific point on the surface of a sample can be analysed by FIB-SEM before or after transferral to an X-ray spectrometer, X-ray diffraction system or a light/confocal microscope.

Principally the CorrStub™ consists of;

- A precise V-notch on an SEM stub (pin, cylindrical, threaded, etc. Figure 1).
- A precisely applied high quality carbon tab that provides a highly conductive and smooth surface.
- A lightweight and stackable storage solution.

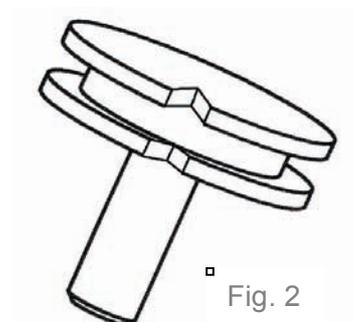


Fig. 2

V-notched stub

Any of the standard Agar Scientific aluminium stubs can be supplied with the V-notch. For example, the AGG301 (shown with V-notch in Figure 2) is the most common sample support used in FIB-SEM systems manufactured by TESCAN, Thermo Fisher Scientific and ZEISS.

Cylindrical stubs (compatible with CAMBRIDGE, ISI/ABT/TOPCON and JEOL) or threaded stubs (compatible with Hitachi High-Technologies) can also be supplied with V-notches.

The V-notch has many obvious advantages as it offers a precise X-Y reference point for any samples which are mounted on the stub. The intersection of the X and Y axis of the V-notch provides a zero coordinate reference point, therefore images acquired from a number of instruments can be overlaid using a crosshair and micrometric stage. In addition, the stub surface can be precisely mapped in relation to the V-notch reference point which allows the same stub and sample to be re-visited at a later date or on another imaging platform.

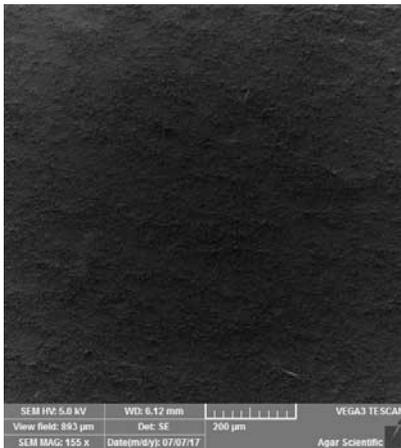
For forensic gunshot residue (GSR) analysis, the CorrStub™ can be etched with a unique combination of alphanumeric characters for sample identification.

Carbon tab

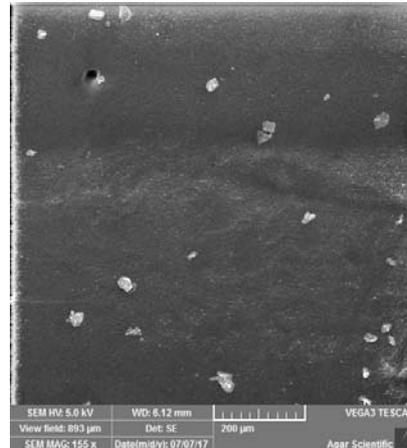
The carbon tab is the most common mounting adhesive used to load samples onto a stub. The type of the carbon tab used for CorrStub™ has specific qualities making it suitable for applications requiring a relatively long time period of sample analysis or processing, such as GSR analysis or FIB-SEM.

Compared to a standard carbon tab, CorrStub™ has a smooth and pore-free surface (Figure 3) which, combined with the V-notch, offers an ease of imaging and analysis using a variety of techniques and instruments.

Surface charge is reduced during FIB-SEM thanks to the aluminium foil and carbon-based adhesive compound which covers both sides. CorrStub™ is much more conductive compared to the standard carbon tab.



SEM image of Carbon tab used for CorrStub™



SEM image of standard Carbon tab

Fig. 3

Package

The standard packaging of CorrStub™ is a lightweight, stackable, plastic stub storage box. For GSR application each CorrStub™ can be packed in a separate plastic tube.

