

Advancing Materials Development with a Phenom SEM

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Graphite Machining Services & Innovations (GMSI) provides products and support for the semiconductor and LED industries.

Peter Guercio and colleagues at GMSI, none of them microscopists, use their Phenom ProX scanning electron microscope (SEM) daily for advanced materials research and development.

The Phenom ProX with EDS also benefits quality control of processes and products. Real time acquisition combined with elemental analysis capabilities provides data 8x faster than before and proved critical for recent product improvements.

GMSI

Graphite Machining Services & Innovations, LLC. is an industry leader in the machining and manufacturing of products made from Graphite and Carbon. While their specialty is Machining Graphite, they also provide customers with a wide array of manufacturing services, such as Machining Plastics, Composites, Metals and a variety of exotic materials.



Peter Guercio

"No other tool can do what the Phenom SEM does!"

Since 1991, Graphite Machining Services & Innovations, LLC. (GMSI) has been a key supplier to top-tier chip and memory manufacturers as well as front-end semiconductor manufacturers.

From Outsourcing to Insourcing

A few years ago, GMSI was outsourcing all SEM work. This took time and resources to send samples out for testing and then wait for results. About 4 years ago, GMSI brought the work in-house with a Phenom G1 SEM. Process improvements were done faster with no wait time for data.

GMSI uses chemical vapor deposition processes to produce SiC films on graphite for the semiconductor and LED industries. The Phenom SEM is used daily for research and development plus quality assurance of processes and products.

Advantages of using a Phenom SEM

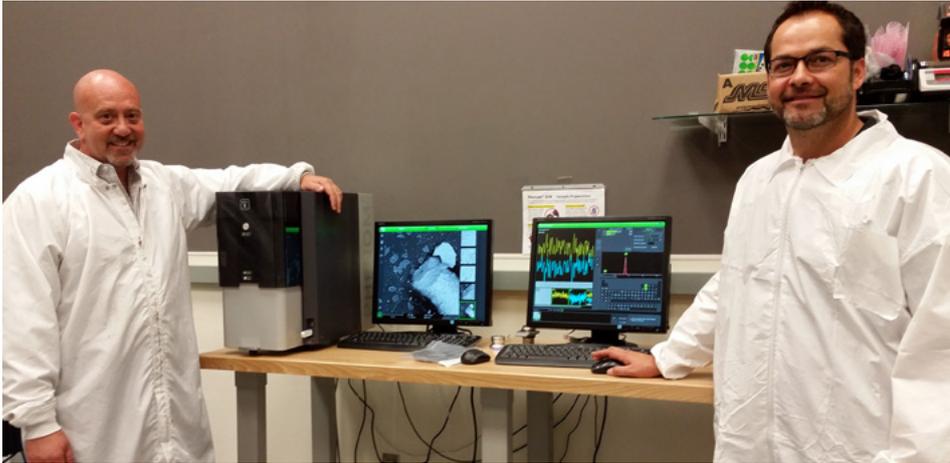
Having a Phenom SEM on site has been a huge time saver. The SEM is used to measure film thicknesses and surface morphology as a function of processing parameters. The Phenom data immediately provides critical feedback of SiC diffusion into the graphite and the crystal structure of the surfaces.

The correlative microscopy ability using the integrated camera is another benefit of the Phenom SEM for GMSI. The optical navigation is synchronized with the electron microscope image to show where defects are located, allowing quick investigation of specific areas of interest.

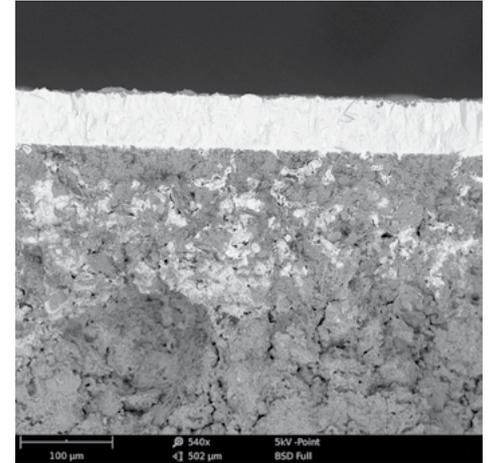
Trading up to speed up R&D

GMSI traded in the G1 for a Phenom ProX with EDS. The higher magnification provides a full picture of every step of the process. The elemental analysis from EDS shows the elemental composition of the films, allowing GMSI to set the deposition parameters to achieve the optimum stoichiometry.

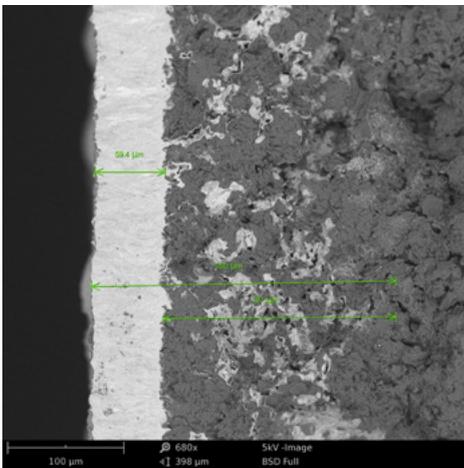
GMSI's most recent product release came to market 8x faster than before, thanks to the real time data acquisition and elemental analysis of the Phenom ProX with EDS. Peter explained: "Without the Phenom ProX SEM, we could not have developed our newest improved process".



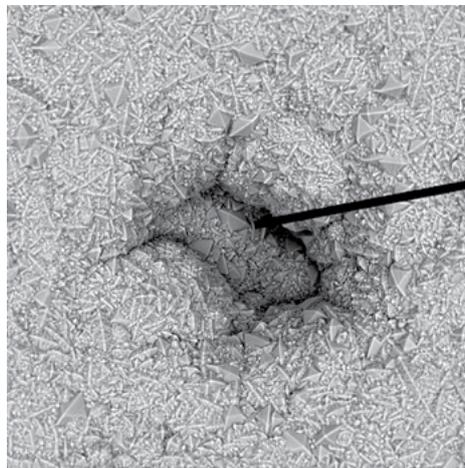
P. Guercio and P. Westphal review elemental analysis data using their Phenom ProX SEM at GMSI in Tempe, AZ



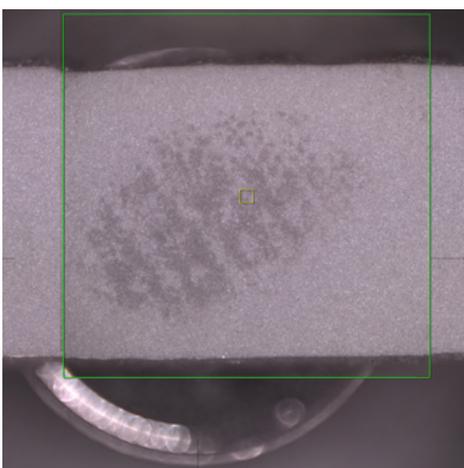
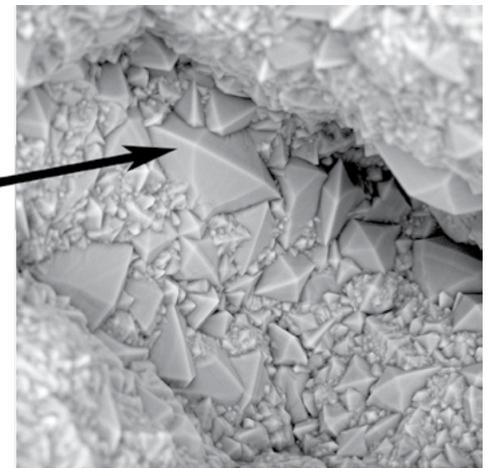
SEM image of SiC film (white layer) on graphite. Image magnification is 540x.



Phenom SEM image of SiC film on graphite. Backscattered electron image shows elemental contrast, indicating diffusion of SiC into the basal planes of the graphite which prevents film delamination.



Crystal morphology is quickly observed with the Phenom SEM, showing film coverage even within defect sites. SEM image magnifications are 1000x and 3900x, left and right, respectively.



The integrated optical camera provides more than correlative microscopy. It is used for QC/QA, shown here for contamination transferred from a glove to the sample.