3D Roughness Reconstruction

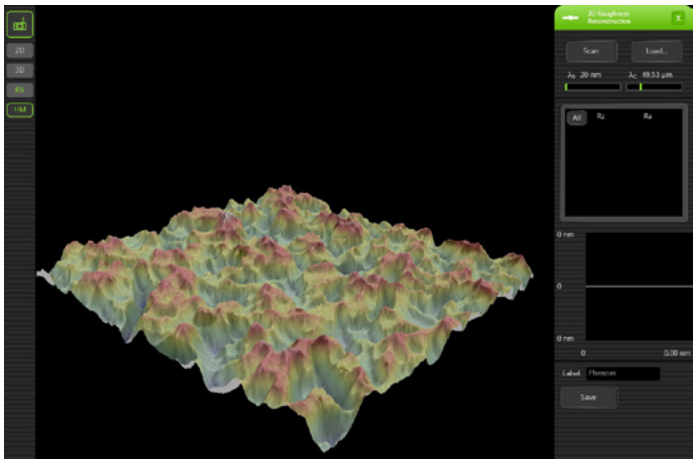
Interpreting sample characteristics

Direct method
Outperforms optical and mechanical measurement systems

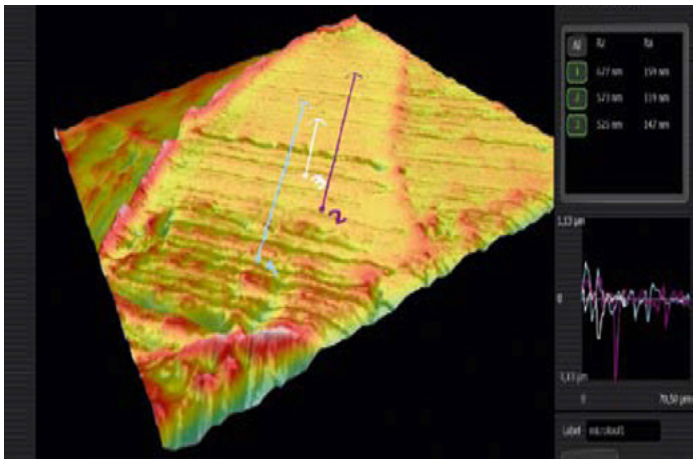
Shape from shading
Based on "shape from shading" technology, no stage tilt required

Automated user interface
Intuitive & automated user interface

Reconstruction
Fast reconstruction of the sample



Roughness reconstruction and colored height map of abrasive material



The 3D Roughness Reconstruction view contains three profile measurement lines. The table on the right contains measurement results Rz and Ra

With the 3D Roughness Reconstruction application, the Phenom desktop scanning electron microscope (SEM) is able to generate three dimensional images and submicrometer roughness measurements. Based on "shape from shading" technology, 3D imaging helps to interpret sample characteristics.

3D

3D imaging helps to interpret sample characteristics and makes images understandable for a larger group of users. It is often difficult, for example, to identify dents, scratches and burrs from flat 2D images.

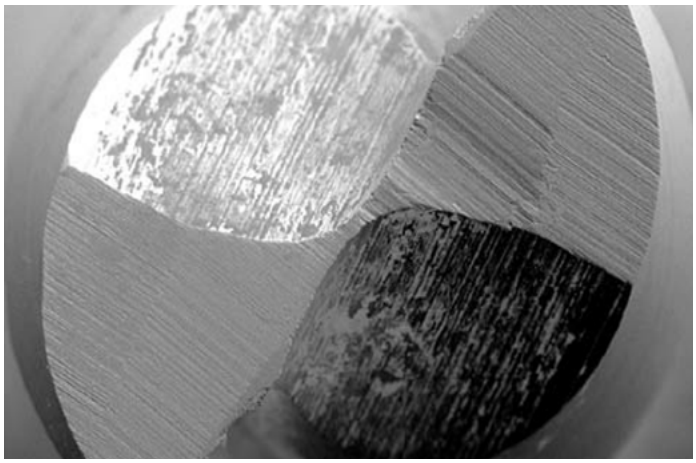
Roughness

Measuring the average roughness (Ra) and the roughness height (Rz) is critical for controlling and understanding production processes. By using SEM imaging for data collection, a much better resolution can be achieved than by using traditional (indirect) methods.

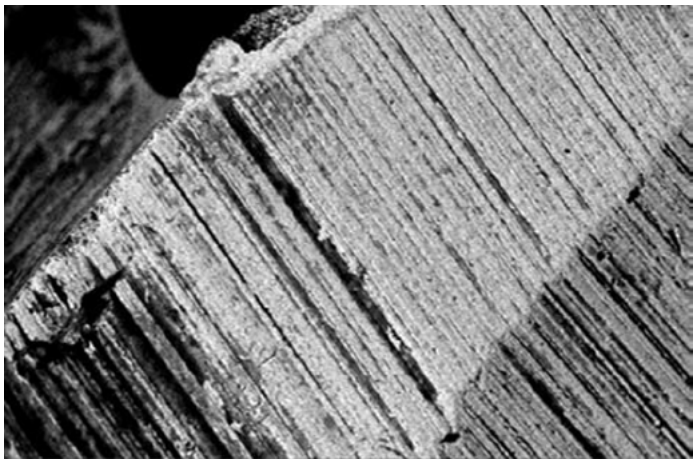
The 3D Roughness Reconstruction application is a desirable addition to the Phenom desktop SEM when one or more of the following are required:

- Quality control in machining
- Texture analysis
- Evidence characterization
- Defect & failure analysis
- Wear analysis-tribology

The 3D Roughness Reconstruction application is available in the Phenom ProSuite that contains multiple Phenom desktop SEM specific applications.



Drill bit, top view at 600x magnification



Drill bit, top view at 2,900x magnification

Benefits

- Outperforms optical and mechanical measurement systems:
  - · High resolution
  - · Insensitive for reflective samples
  - · Direct method
  - · Non-destructive
- Intuitive fully automated user interface
- Based on "shape from shading" technology, no stage tilt required
- Integrated solution
- Fast reconstruction

Specifications

Automated 3D image creation	· Full 3D · 2D or 3D with colored height indication · Filtered 3D for surface roughness
Automated roughness measurement	· Ra (average roughness) and Rz (roughness height) · User defined waviness filtering · Up to 5 line measurements
Output	· Line profiles · CSV files · 2D/3D view images
Part of ProSuite	Network storage enabled Phenom integrated system

Field of view 2 mm – 10 µm

Height profile

Position identification

CSV – automatically generated statistical data

3D reconstruction in a few seconds

512 x 512 pixel resolution

ProSuite

ProSuite is an optional application platform that has been developed to further enhance the capabilities of the Phenom system. ProSuite enables maximum information to be extracted from images obtained on the Phenom imaging system.
It offers multiple solutions to specific application needs. ProSuite contains standard applications such as Automated Image Mapping and Remote User Interface. Optional applications are 3D Roughness Reconstruction, FiberMetric, ParticleMetric, and PoroMetric. Virtually all the properties of a sample can be revealed using the Phenom desktop SEM in combination

Elemental Mapping and Line Scan

Elemental Mapping reveals the distribution of elements within the sample. The selected elements can be mapped at a user specified pixel resolution and acquisition time. The real time mapping algorithm shows live build up of the selected element maps while storing spectra of each pixel. This allows elements to be added or removed at any time during or after the mapping process. Mixing any number of elements with the backscattered electron image gives users a clear insight into the distribution of elements within the sample. Mapping can be done on the image as a whole or to save time, on a Selected Area (SA). Any area can be selected in a rectangular shape on the image location.
Line Scan allows analysis to be performed over a selected line. The number of points and dwell time per point can be selected individually. A line profile of every selected element is displayed on the screen. On top of that, the results can be easily exported and reported via an automated template. Multiple analyses can be performed in sequence without user intervention.

ProSuite Specifications

System
- Automated collection of images
- Real-time remote control
- Intuitive single page user interface
- Standard applications included: Automated Image Mapping & Remote User Interface

Optional

3D Roughness Reconstruction
- Based on "shape from shading" technology, no stage tilt required
- Fast reconstruction

FiberMetric
- Fast and automated collection of all statistical data
- Large range of fibers and pores can be measured

ParticleMetric
Morphology and particle size data for submicron particle applications

PoroMetric
Fully automated visualization and analysis of pores

Elemental Mapping and Line Scan Specifications

Elemental Mapping

• Element selection	10 individual user specified maps, plus backscatter image and mix-image
• Selected area	Any size, rectangular shaped
• Mapping resolution range	16 x 16 - 512 x 512 pixels
• Pixel dwell time range	10 - 250 ms

Line Scan

• Line Scan resolution range	16 – 512 pixels
• Points dwell time range	50 – 250 ms
• Total number of lines	12

Report Docx format

Phenom-World BV, Dillenburgstraat 9T, 5652 AM Eindhoven, The Netherlands, www.phenom-world.com

PHENOMWORLD