METRICAL
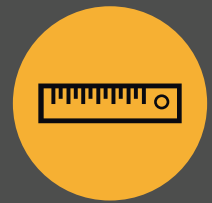## METALLURGICAL & MATERIALS ANALYSIS

GRAIN SIZE

MEASUREMENT

SG IRON

Metrical is a modular quantitative image analysis software Specific to Metal Industries.

Introduction of Metrical

Unitron's software designed for industrial materials, Scientists, Metallurgists, Laboratory technicians, and R & D engineers who need improved solutions for quality control and product development.

Metrical is computer-aided quantitative analysis results follows strictly ISO & ASTM technical standards.

The software is powerful to handle different image format BMP, TIFF, GIF, JPEG etc. It support many cameras, USB 2.0 & USB 3.0, devices, TWAIN input devices.

This exceptional software produces as much as 80% more picture points in image window than competitive softwares.

The image processing technique will streamline image capture, measurement and enhancement, while improving the accuracy of your results. Live measurement saves lot of your time.
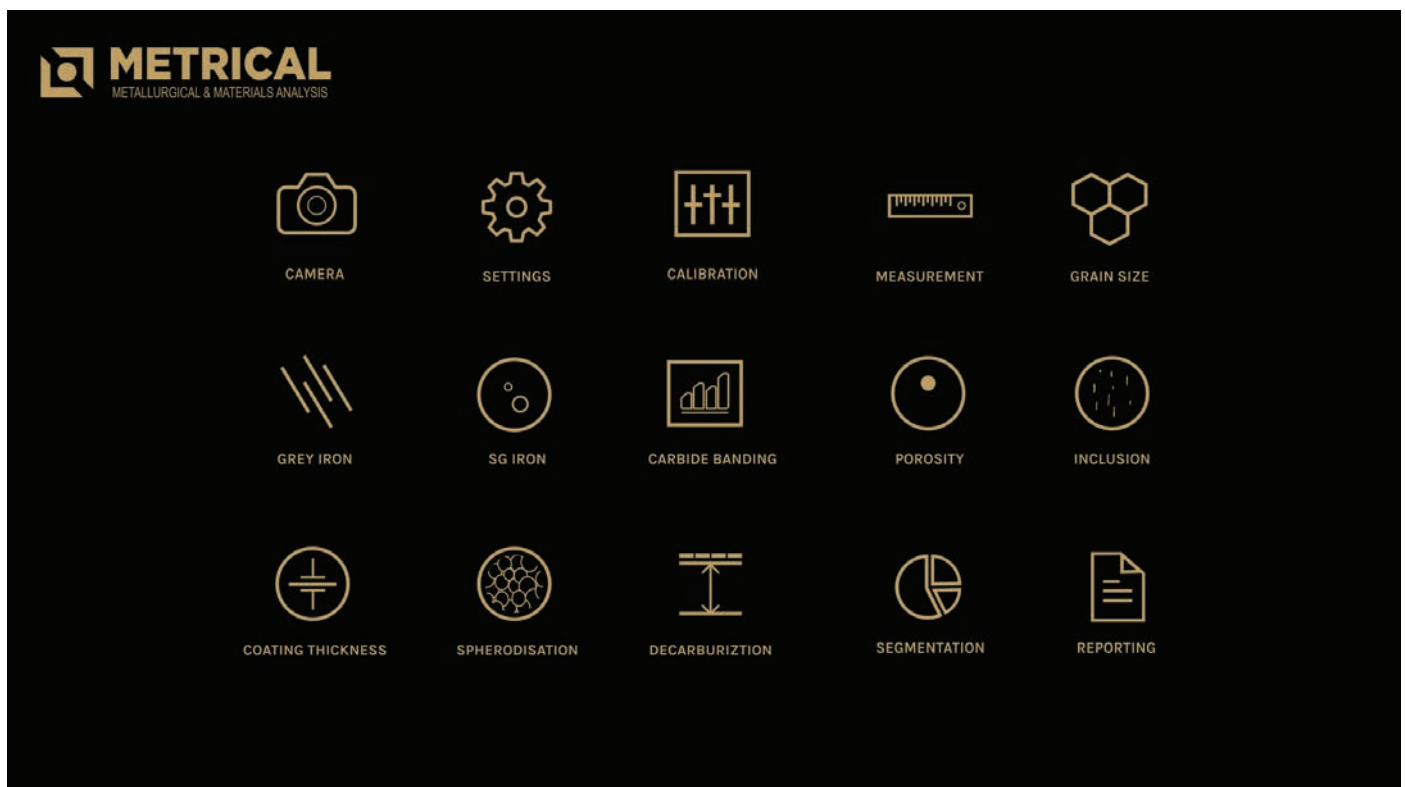

This is the first look of UI of Metrical

Modules of Metrical

Some of the major modules in Metrical are as follows:

CAMERA

One can select different display/capture sizes along with other setting like white balance, brightness, contrast, Hue, Saturation can be changed on live displayed image. Once all setting are done, image can be captured in appropriate folder for appropriate analysis.
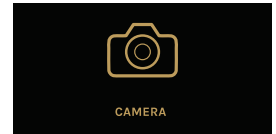
CALIBRATION

Calibration should be performed on all the objectives of the microscope, where Digital Camera is installed. Calibration should be performed only when all hardwares are finally fixed. In case of readjustments or replacement of any part, calibration should be done again.
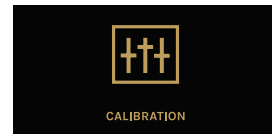
MEASUREMENT

With the Measurement module one can obtain measurement on manually drawn lines on traces, shapes or by outlining an object Which can be accumulated and logged on to the results worksheet from where they can be stored to a file, printed or transferred to spread sheet for further analysis or statistics.
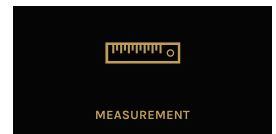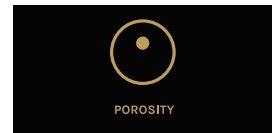
GRAIN SIZE

This module can quickly perform automatic, objective and repeatable grain size analysis to industrial standards to determine ferritic & austenitic grain size in steed, international method ASTM E-112, E-93, E1181 are used.

POROSITY

Pores, due to their contrast with the rest of the image, are relatively easy to detect automatically the module allows a user to recognize and measure the porosity in the material according to ASTM B276 Standard Thresholding readily accomplished using gray scale techniques. The dark phase of porosity is detected in red bitplanes.

SEGMENTATION

Segmentation is a method of image partitioning on the intensity / grayscale range of its parts. Since a phase is detected and its area is estimated on the basis of its intensity / grayscale, an option for delineating phases from the histogram is also provided. Multiple phases are identify by colored overlays and can be simultaneously displayed in the same field of view.

DECARBURIZATION

The module is used to determine the depth of Decarburisation form the changes in structural quality In partial decarburisation is where the carbon content is reduced but there is on total Decarburisation is measured in work piece to the limit of the limit of the ferritin layer with almost total carbon removal if compliance ASTM E-1077-91 Standard

SG IRON

SG Cast Iron or Nodules are also called DUCTILE IRON or SPHEROIDAL GRAPHITE IRON. Nodules Cast Iron are produce from graphite during Solidification. Ductile Iron Analysis module provides a chance to analyze an image on the basis of ASTM A-247-67, ISO-945-1.

GRAY IRON

Grey Iron or grey Cast Iron is a type of Cast iron that has a graphitic micro structure. Grey iron analysis module provides a chance to analyze an image on the basis of ASTM A-247-67, ISO 945-1.

Modules of Metrical

CARBIDE

Iron carbide or Cementite is an intermetallic component of iron and Carbon. While iron Carbide as present in most steels and Cast Iron, it is produced as raw material in the iron carbide process, which belongs to the family of alternative iron making technology.

COATING THICKNESS

Plating or coating thickness is determined by cross-sectional microscopy method. The specimen is cross-sectioned, mounted, polished and microscopically evaluated for measuring the plating or coating thickness, sometimes, etching of the core base metal may be necessary to accurately measure the coating or plating thickness. The test method covers measurements of the local thickness of mental and oxide coatings by the microscopical examination of cross sections using an optical microscope.

SPHERODIZATION

This module is designed to analyze spheroidal graphite (nodules). The nodules are separated from non-nodules on predefined spheroidicity. Nodules acquire blue color and non-nodule get red color. Nodules from (designated by Roman numbers from I to VI) and size (designated by Arabic numbers 1 to 8) are reported along with the calculated nodules/sq mm.

INCLUSION

Using Metrical software a user can identify four types of inclusion.
SULFIDE TYPE (A TYPE), ALUMINA TYPE (B TYPE)
SILICATE TYPE (C TYPE), GLOBULAR TYPE (D TYPE)
Each type is further divided into Thin and Heavy, based on the width parameters.

SETTINGS

The Module SETTING is designed to set various parameters for first time when software is installed. The setting options are available to choose ISO/ASTM standard calibration, setting in report format, setting of various parameter on printed image in report. Once all settings are done, you need one button click for all Analysis. All settings are stored till you change them in future. Do not change them in routine, it is not necessary.
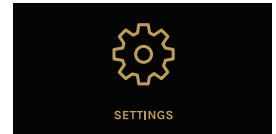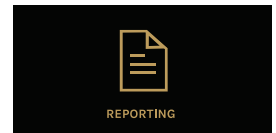
REPORTS

All reports are saved in the folder and can be retrieve anytime in future.

1. Measurement | 2. Grain Size | 3. Porosity | 4. Decarburization | 5. Segmentation | 6. SG Iron |
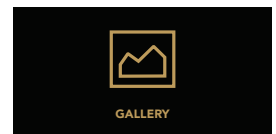
7. Gray Iron

GALLERY

Four Folders are available to view any Captured images. The folders are:

1. Nodularity | 2. Flake | 3. Carbide | 4. Line Measurement | 5. Grain Size | 6. Porosity | 7. Decarburization |

8. Segmentation | 9. SG Iron | 10. Coating Thickness

Camera

One can select different display/capture sizes along with other setting like white balance, brightness, contrast, Hue, Saturation can be changed on live displayed image. Once all setting are done, image can be captured in appropriate folder for appropriate analysis.
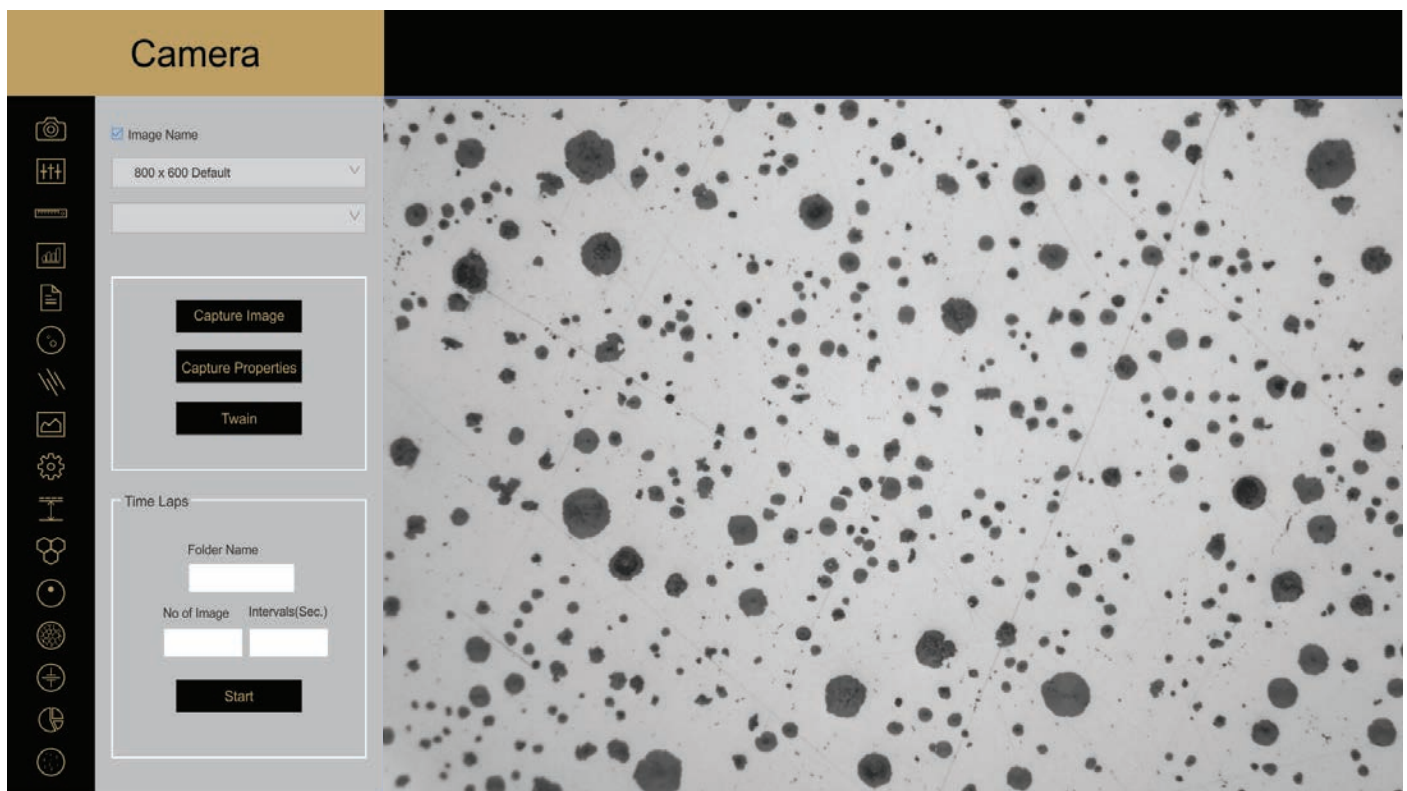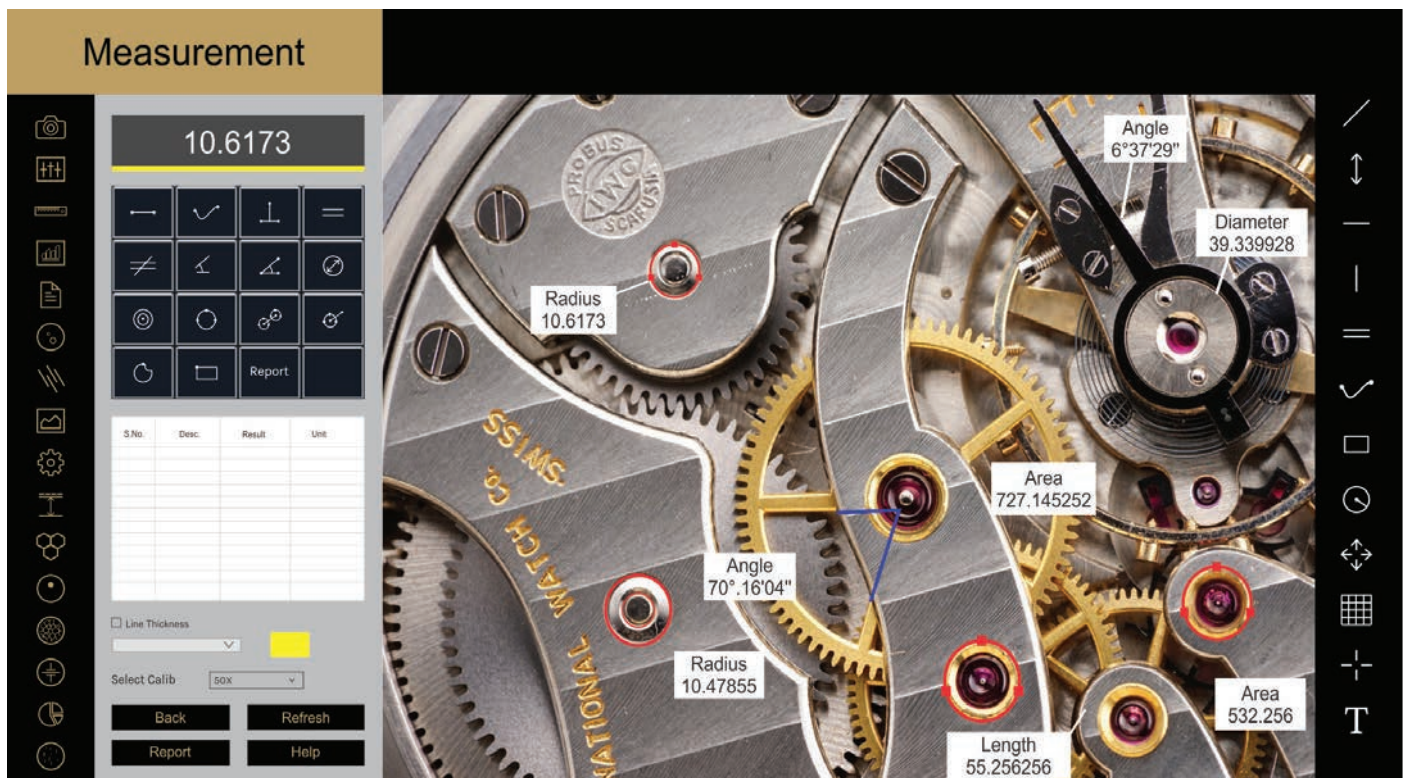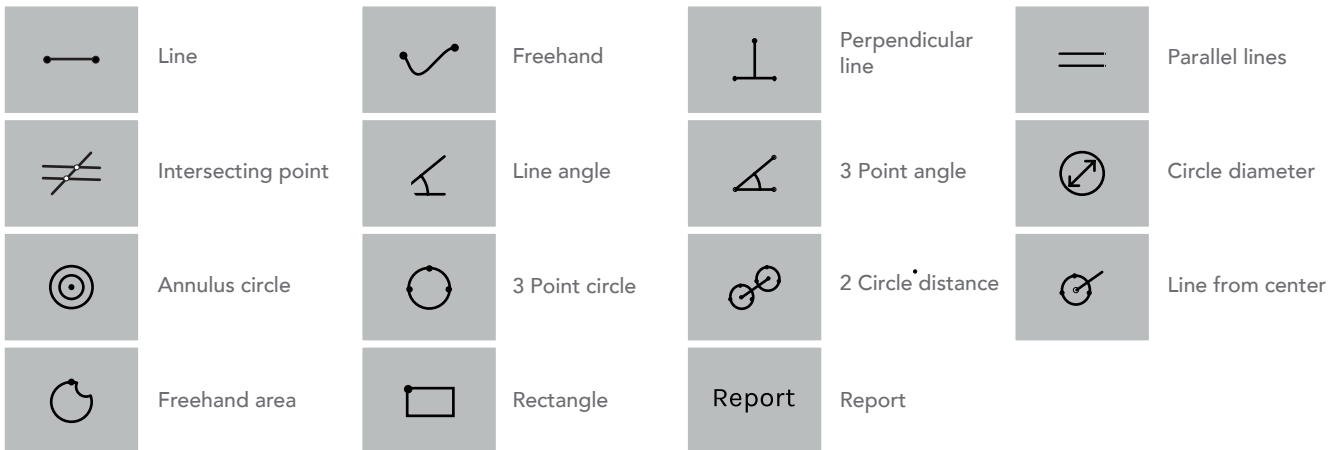

Software Interface

Calibration

Calibration should be performed on all the objectives of the microscope, where Digital Camera is installed. Calibration should be performed only when all hardwares are finally fixed. In case of readjustments or replacement of any part, calibration should be done again.
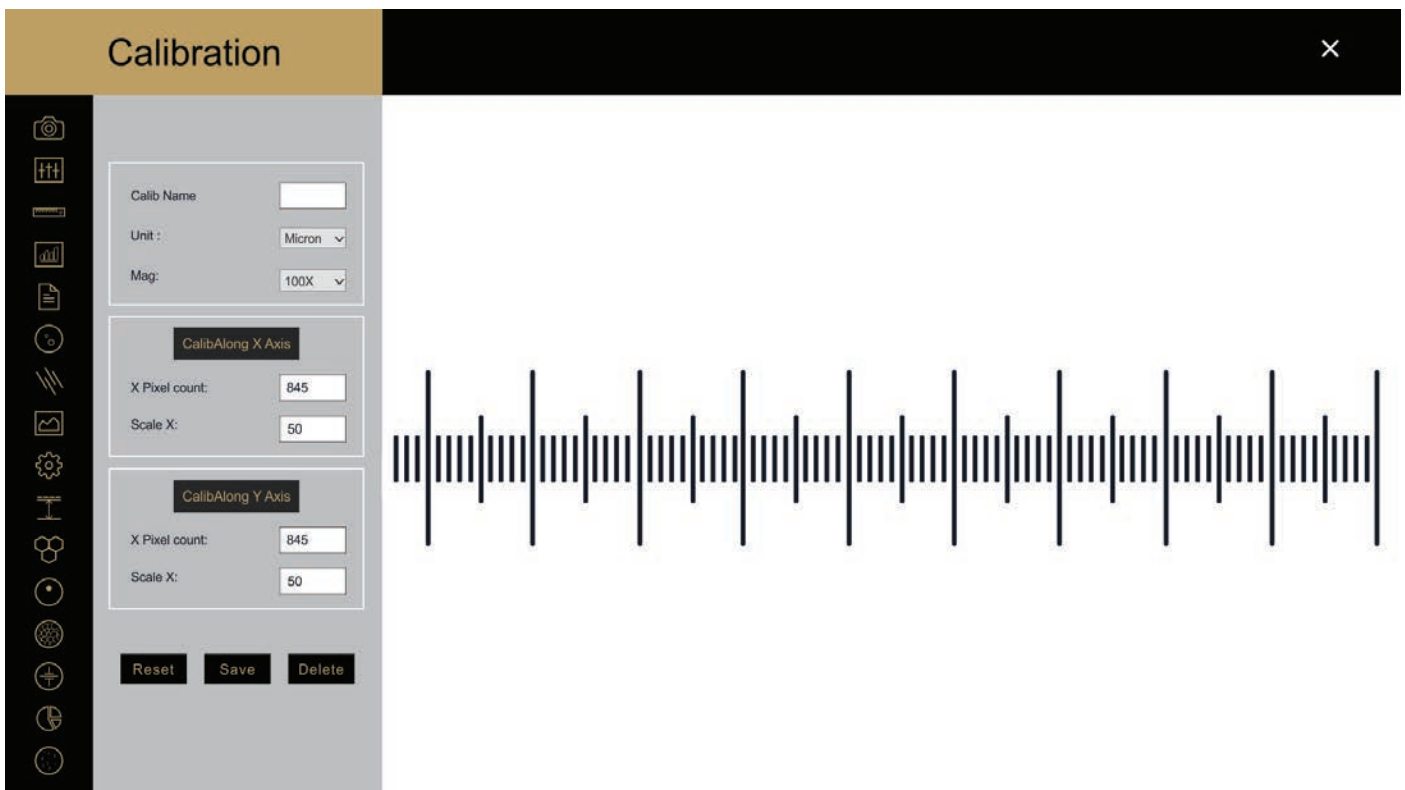
Software Interface

Measurement

With the Measurement module one can obtain measurement on manually drawn lines on traces, shapes or by outlining an object which cannot be accumulated and logged on to the results worksheet from where they can be stored to a file, printed or transferred to spread sheet for further analysis or statistics.

—	Line	⌄	Freehand	⊥	Perpendicular line	=	Parallel lines
≠	Intersecting point	∠	Line angle	∠	3 Point angle	⊘	Circle diameter
◎	Annulus circle	◯	3 Point circle	⦿	2 Circle distance	⦸	Line from center
◝	Freehand area	▭	Rectangle	Report	Report		

Software Interface

Grain Size

This module can quickly perform automatic, objective and repeatable grain size analysis to industrial standards to determine ferritic & austenitic grain size in steed, international method ASTM E-112, E-93, E1181 are used.

Comprehensive selection of analysis technique are:

• Lineal intercept method • Abrams three circle method. • Snyder & graft method. • Comparison method

• Random intercept method • Manual grain size.

This wizard measures the Grain number, the mean area, mean intercept length, at high speed according to selected method.
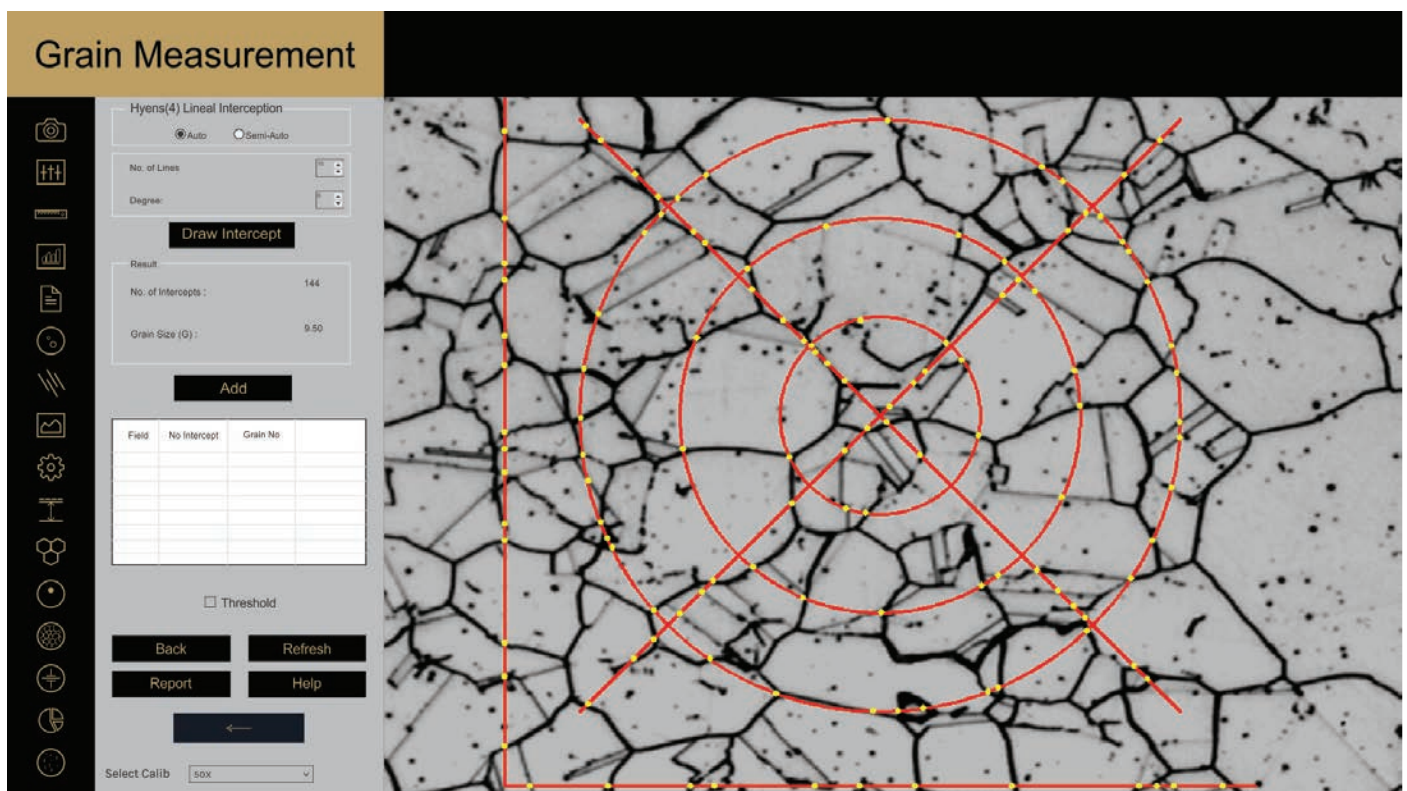
Software Interface
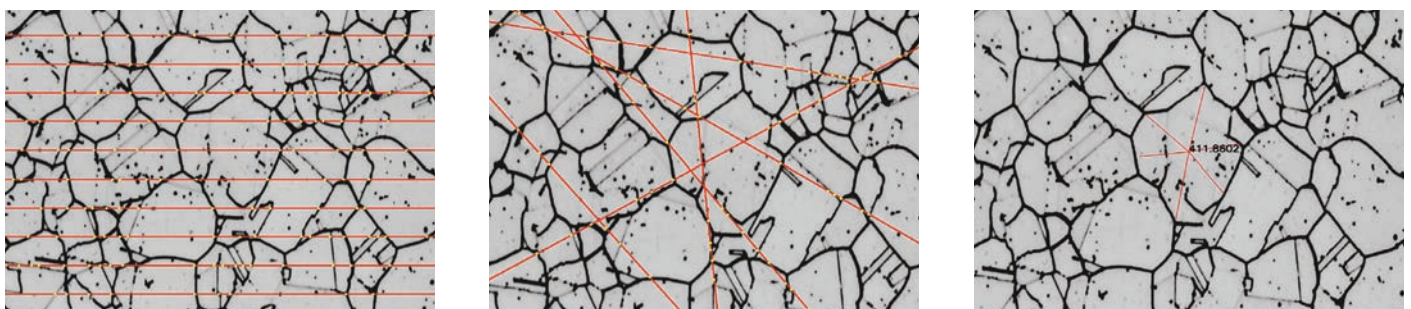
Sample Image

Segmentation

Segmentation is a method of image partitioning on the intensity / grayscale range of its parts. Since a phase is detected and its area is estimated on the basis of its intensity / grayscale, an option for delineating phases from the histogram is also provided. Multiple phases are identify by colored overlays and can be simultaneously displayed in the same field of view. The results and images displayed get stored in to distinguish the phases prominently. Various filters like Despeckle, Smoothing etc can be used before doing the phase.

A histogram for gray scale images is created once you open the Segmentation Module. The X-axis represents intensity scale between 0-255. The Y-axis represents number of pixels in the image. analysis. the industrial standard automatically.

HISTOGRAM: Phase allows the user to designate up to ten different threshold settings to identify material phases and name each of these phases. The color between two lines signifies a particular phase.

INTENSITY: The Gray Intensity range of the current phase gets display continuously in the dialogue box.

SELECTED PHASE: This property enable the user to know the percentage area of a specific range of intensity just by clicking the mouse. All previous operations have to be deleted and Preview should be on None.

Software Interface

Porosity

Pores, due to their contrast with the rest of the image, are relatively easy to detect automatically the module allows a user to recognize and measure the porosity in the material according to ASTM B276 Standard Thresholding readily accomplished using gray scale techniques. The dark phase of porosity is detected in red bitplanes. The total number of pores are counted along with their percentage of minimum & maximum size are also identified and reported. The whole process is fully automatic.
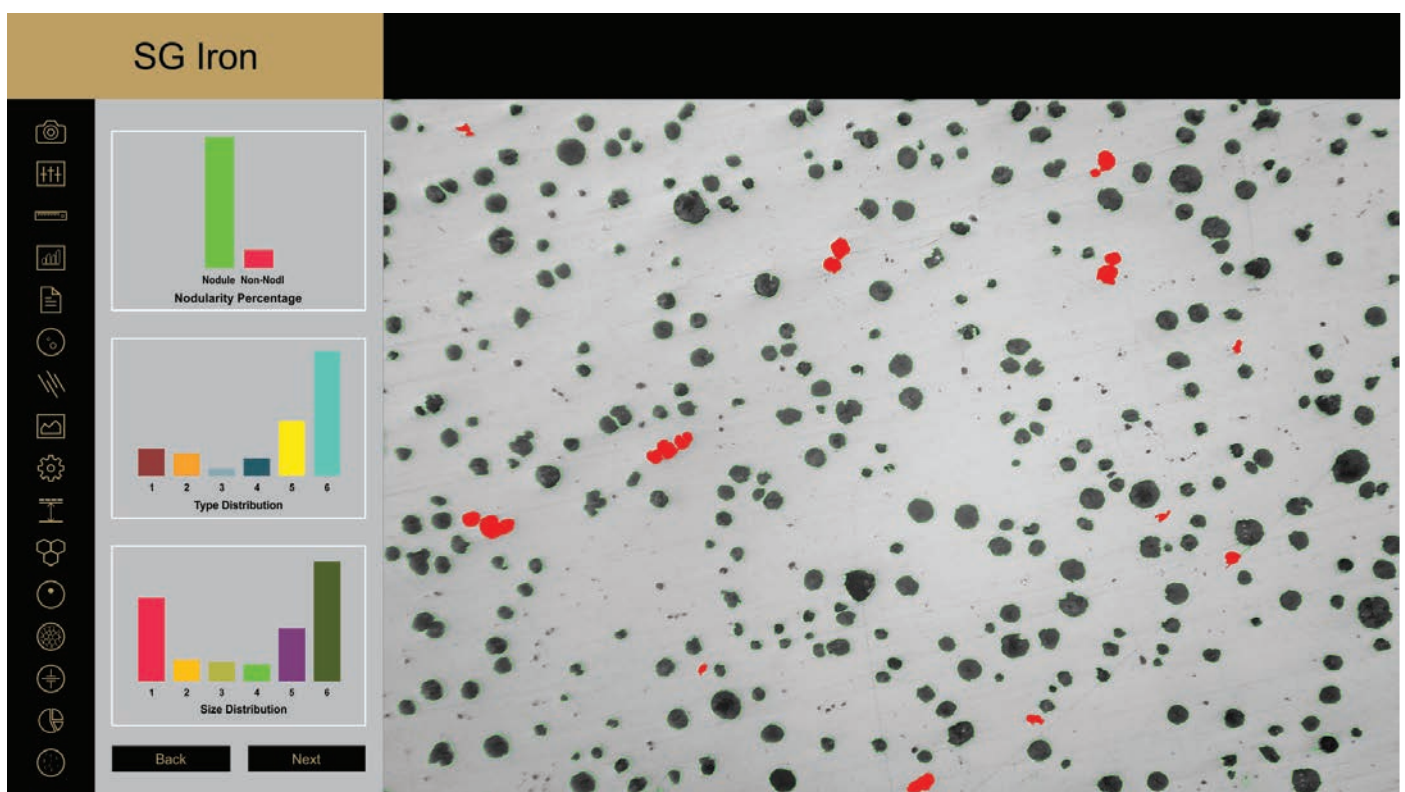

Software Interface
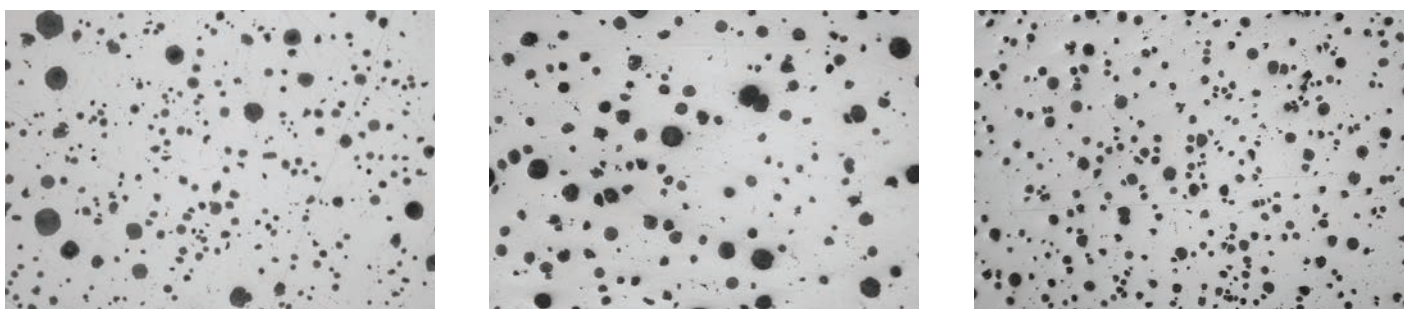

Sample Image

Ductile Iron/Nodularity

Ductile Iron, also known as ductile cast Iron, Nodular Cast Iron, Spheriodal Graphite Iron & SG Iron is a type of Graphite rich cast Iron. We use image processing algorithms like segmentation using Global thresholding, Boundary detection and Artificial Neural Network. Nodules touching boundaries are excluded in analysis. Artifacts less than 10 microns are excluded. Non–nodules are separated from Non-nodules on predefined spherodicity. For analysis of SG Iron, we compute quality parameters such as Nodules counts, Nodule Size (designated by Arabic no. 1 to 8), Nodule form (designated by roman number I to VI). All analysis are done with single button push.

In the second step, etched samples are analysed. The software automatically calculates the percentage Graphite, Pearlite once the analysis completed. All data of Non-etched and etched sample is appended into a results spreadsheet directly with in the image analysis software.

Reports containing relevant analysis data and associated images are generated with one button push.
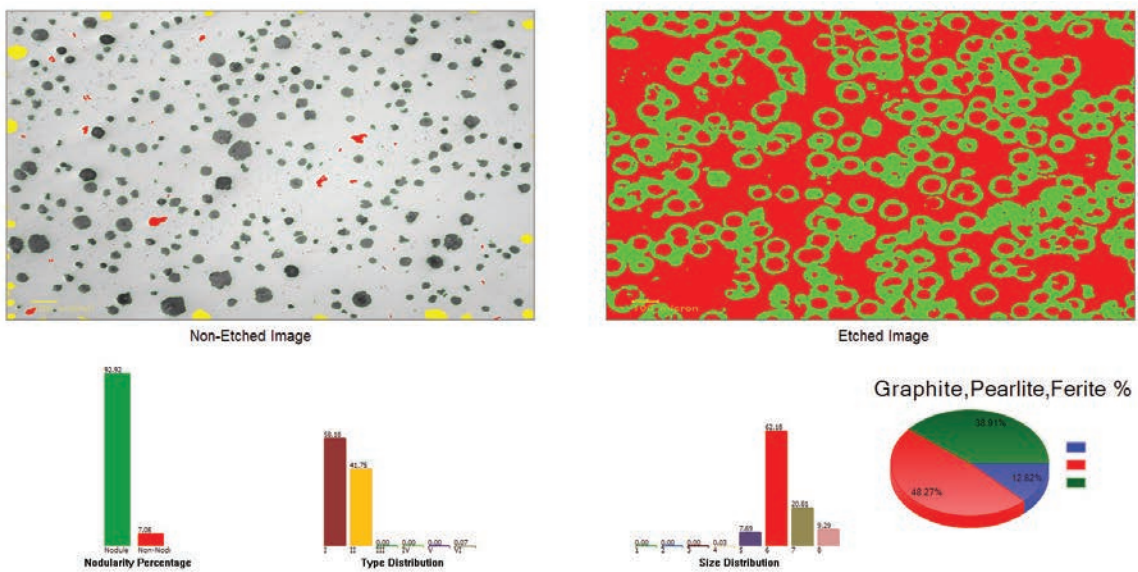

Software Interface

Sample Image

Ductile Iron/Nodularity
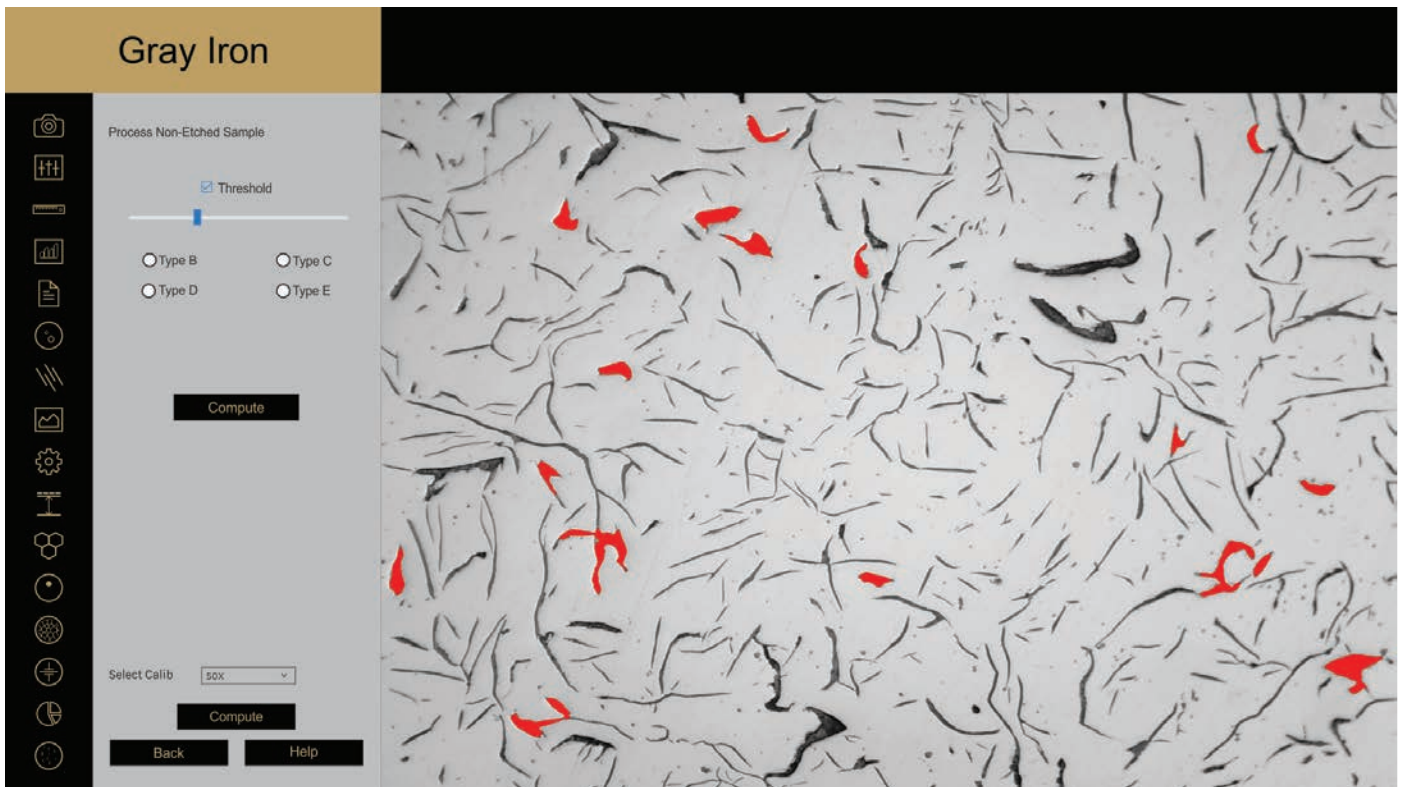

Software Interface

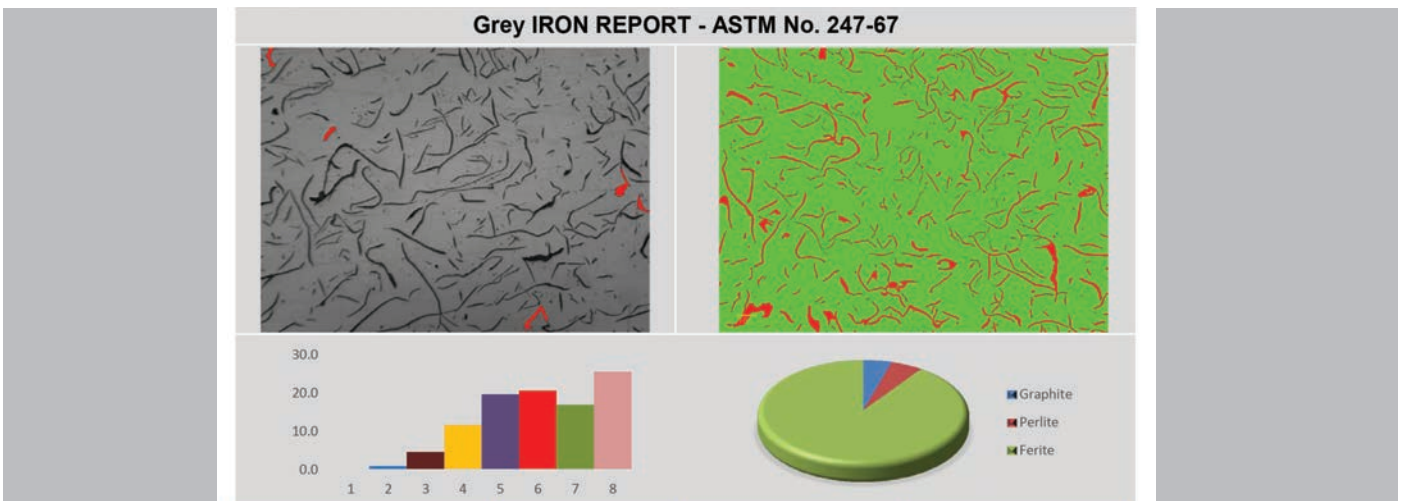

Final Report

Gray Iron/Graphite Flakes

Gray Iron or Gray Cast Iron is the graphite flakes structure that is created during the cooling process. It is named after the gray color of the fracture its forms, which is due to the presence of graphite. The application measures graphite length in gray iron. The shorter the A type graphite flakes, the highest the strength and better the ductility. The automatic, one button computer program quantitatively analyses the graphite length in Metallography. The graphite sizes are reported in 1-8 classes of size according to ASTM 247-67 or ISO 945 -1 standards. It categorizes graphite flakes from namely type A,B,C,D & E in microstructure sample on the basis of orientation.

The percentage of pearlite is calculated by excluding the graphite area. The matrix of pearlite , Ferrite , graphite are reported in etched sample .

Report is generated wit specific international standards chosen by the user.


Software Interface

Final Report

Decarburization

The module is used to determine the depth of Decarburisation form the changes in structural quality In partial decarburisation is where the carbon content is reduced but there is on total Decarburisation is measured in work piece to the limit of the limit of the ferritin layer with almost total carbon removal if compliance ASTM E-1077-91 Standard
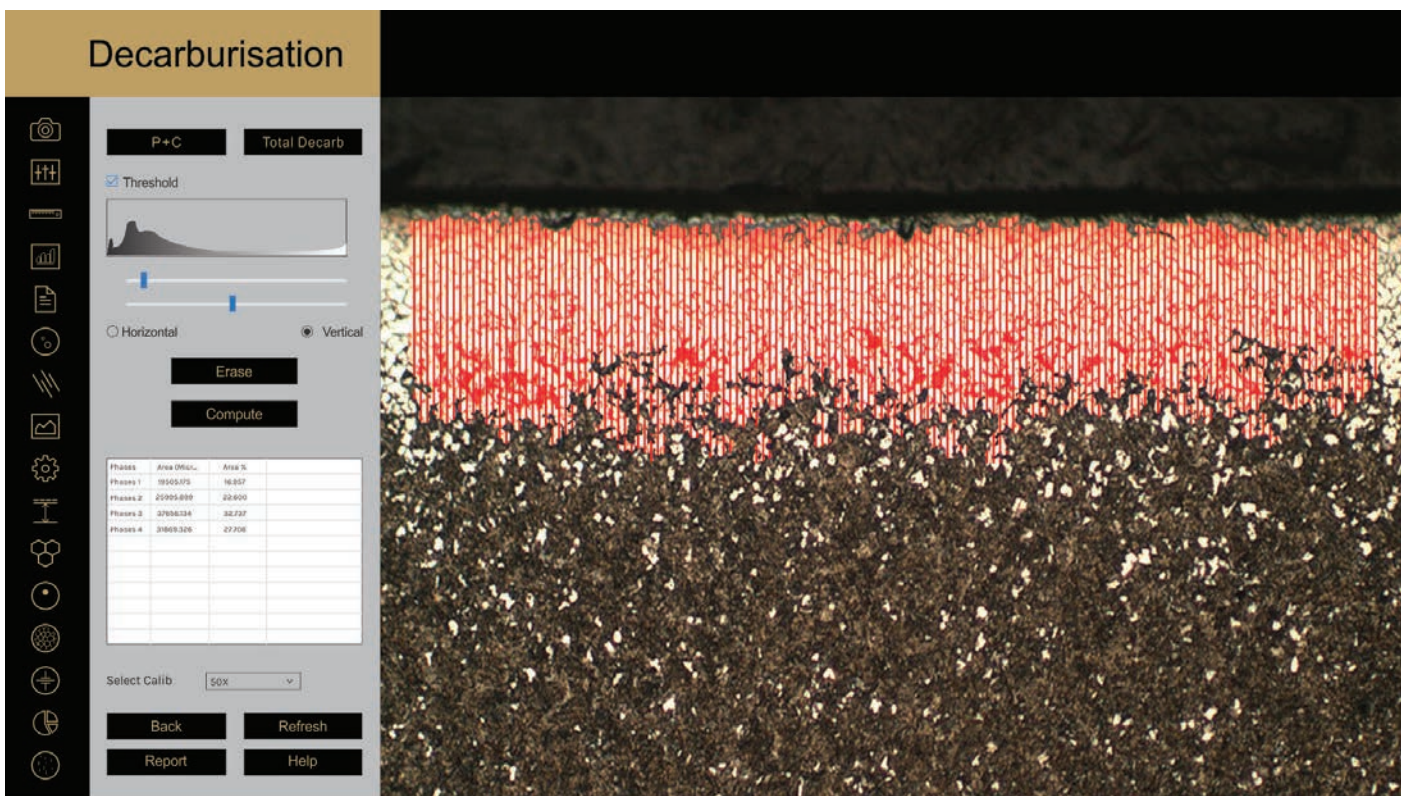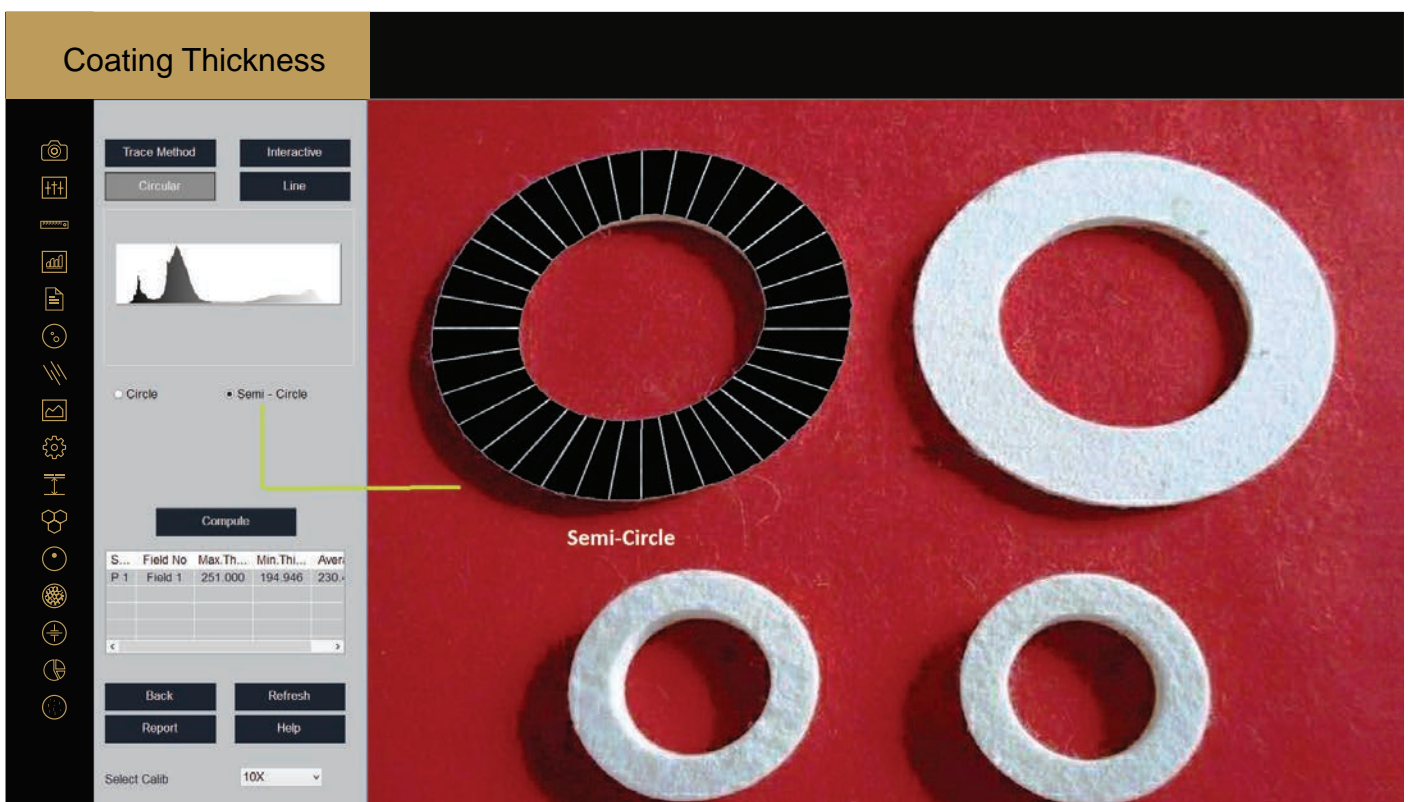

Software Interface
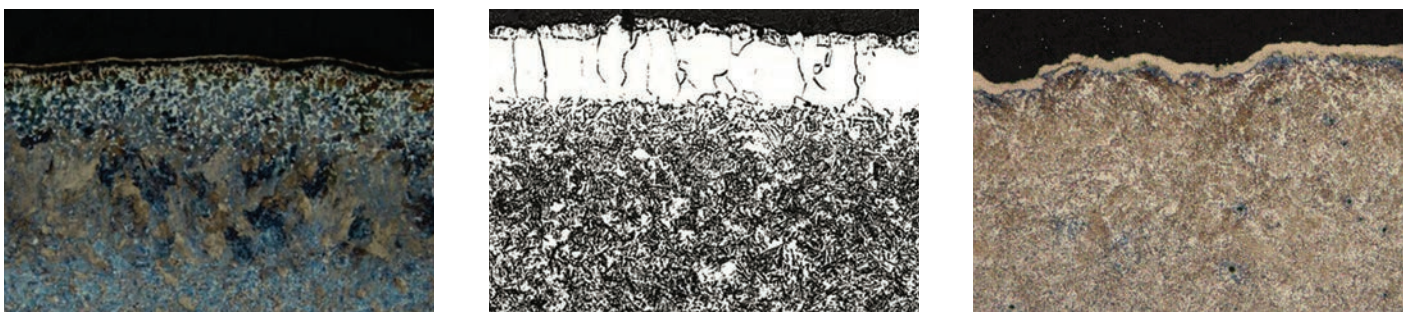
Sample Image

Coating Thickness

Plating or coating thickness is determined by cross-sectional microscopy method. The specimen is cross- sectioned, mounted, polished and microscopically evaluated for measuring the plating or coating thickness, sometimes, etching of the core base metal may be necessary to accurately measure the coating or plating thickness. The test method covers measurements of the local thickness of mental and oxide coatings by the microscopical examination of cross sections using an optical microscope. Under good condition, when using an optical microscope, the method is capable of giving an absolute measuring accuracy of 0.8 mm. this with determine the suitability of the method for measuring the thickness of thin coating.
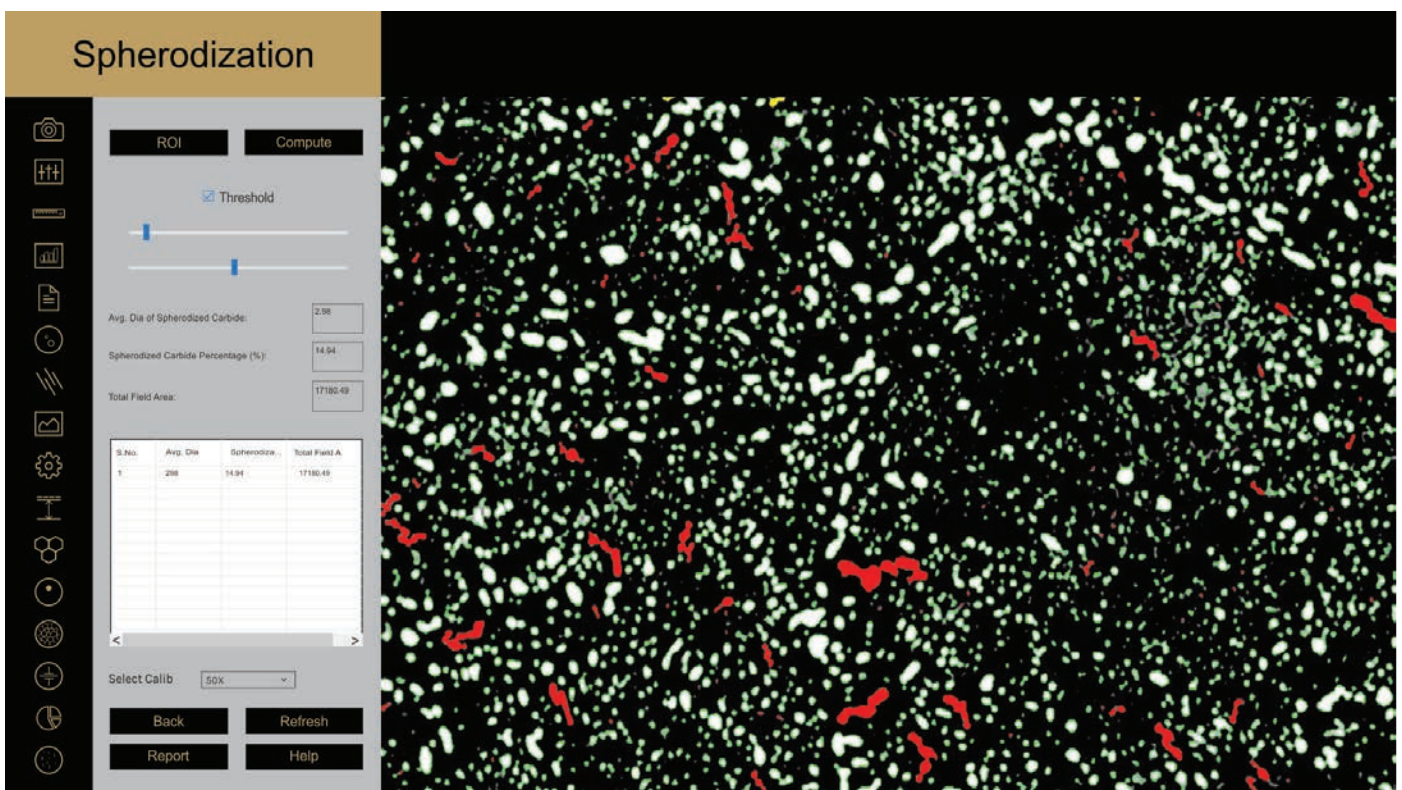

Software Interface
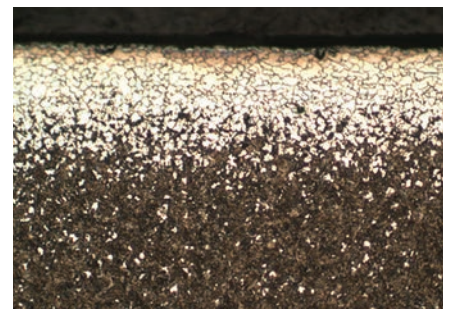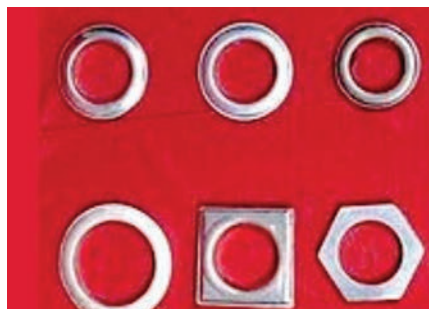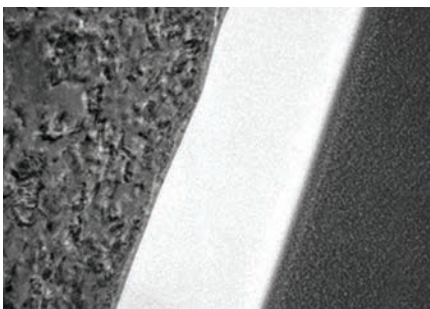
Sample Image

Spherodization

This module is designed to analyze spheroidal graphite (nodules). The nodules are separated from non-nodules on predefined spheroidicity. Nodules acquire blue color and non-nodule get red color. Nodules from (designated by Roman numbers from I to VI) and size (designated by Arabic numbers 1 to 8) are reported along with the calculated nodules/sq mm.

Software Interface
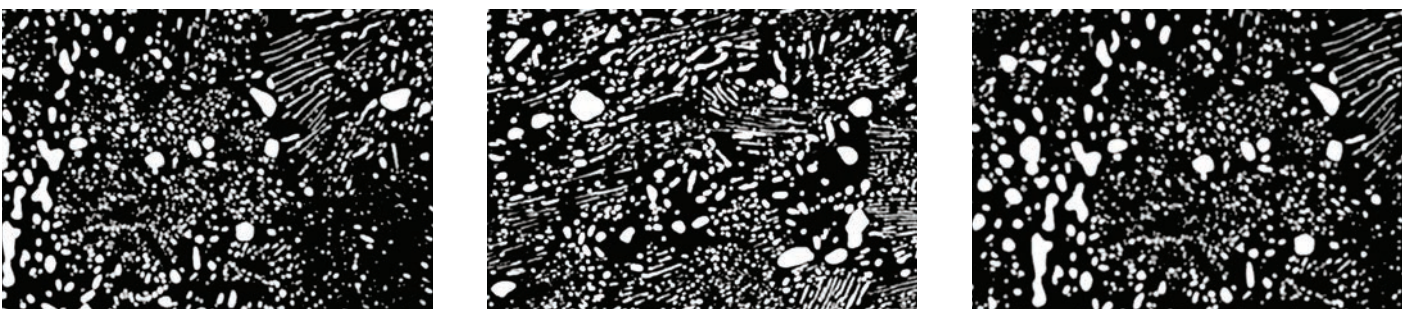
Sample Image

Carbide Banding

Iron carbide or Cementite is an intermetallic component of iron and Carbon. While iron Carbide as present in most steels and Cast Iron, it is produced as raw material in the iron carbide process, which belongs to the family of alternative iron making technology.

Software Interface

Sample Image

Non Metallic Inclusion

Using Metrical software a user can identify four types of inclusion..
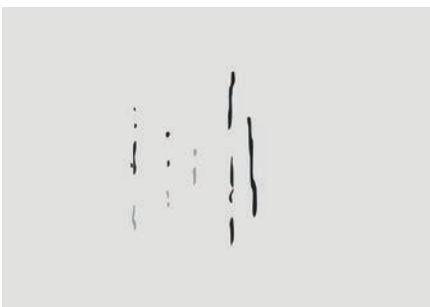
SULFIDE TYPE (A TYPE), ALUMINA TYPE (B TYPE)

SILICATE TYPE (C TYPE), GLOBULAR TYPE (D TYPE)

Each type is further divided into Thin and Heavy, based on the width parameters.

Software Interface

Sample Image

Settings

The Module SETTING is designed to set various parameters for first time when software is installed. The setting options are available to choose ISO/ASTM standard calibration, setting in report format, setting of various parameter on printed image in report. Once all settings are done, you need one button click for all Analysis.

All settings are stored till you change them in future. Do not change them in routine, it is not necessary.

Software Interface

If click on settings icon, new UI will open. The platform help you to decide the shortcuts of your working. If you choose any of radio button correctly, your working will have no scope for mistake and software will be one button working

1. Report Type

Options are available to get report either in ASTM or ISO formats. Choose any of them, this will be automatically be in default setting till you modify in future.

2. Set Default Use

Our software give a choice to work either on live display images or you can capture first all images and work on them later.

• It means you want to work on live images. • This is for working on stored / captured images.

3. Select Calibration

Choose calibration which are available in stored data. Usually we do all work on 100X objective in Cast Iron.

4. Set 100 Micron Line

If you need Scale bar on image choose the fourth options available:

• To Show boundary click it if you want to see contour around the graphite.

• Click on Show Number if you want to display counting on graphites.

6. Set Gallery Path

Gallery path is set by default. But if you need to change this path, you can do necessary changes.

7. SG Iron

Various options are available to show different parameters on Nodules. Choose it if you require otherwise contour is created by default.

8. Aspect Ratio

This is usually fixed. But change only if required.

8.1 Two templates are available

• Report with chemical composition and physical analysis properties composition.

• Report without chemical & physical properties.

Gallery

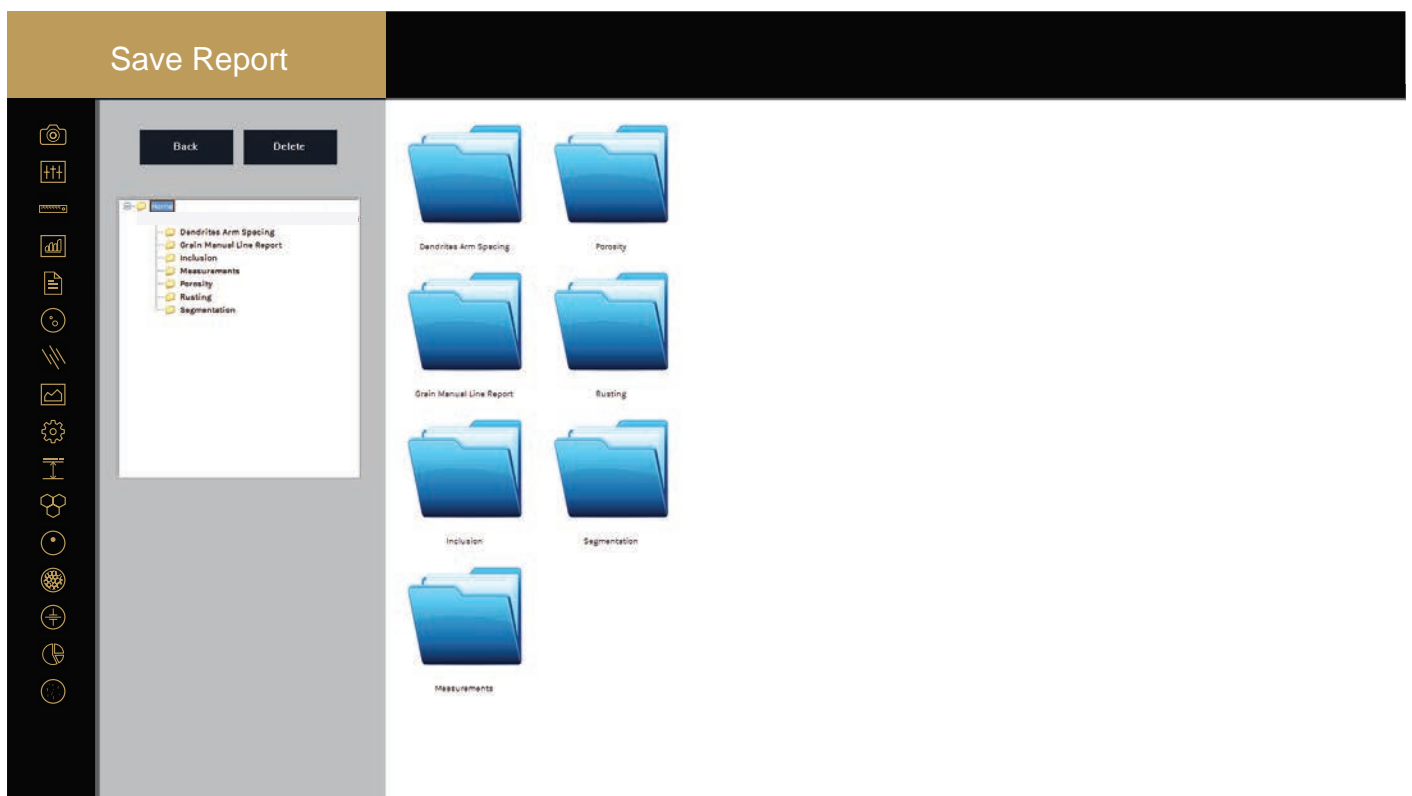Four Folders are available to view any Captured images. The folders are:

1. Measurement

2. Segmentation

3. Grain Size

4. Porosity

5. Decarburization

6. SG Iron

7. Gray Iron
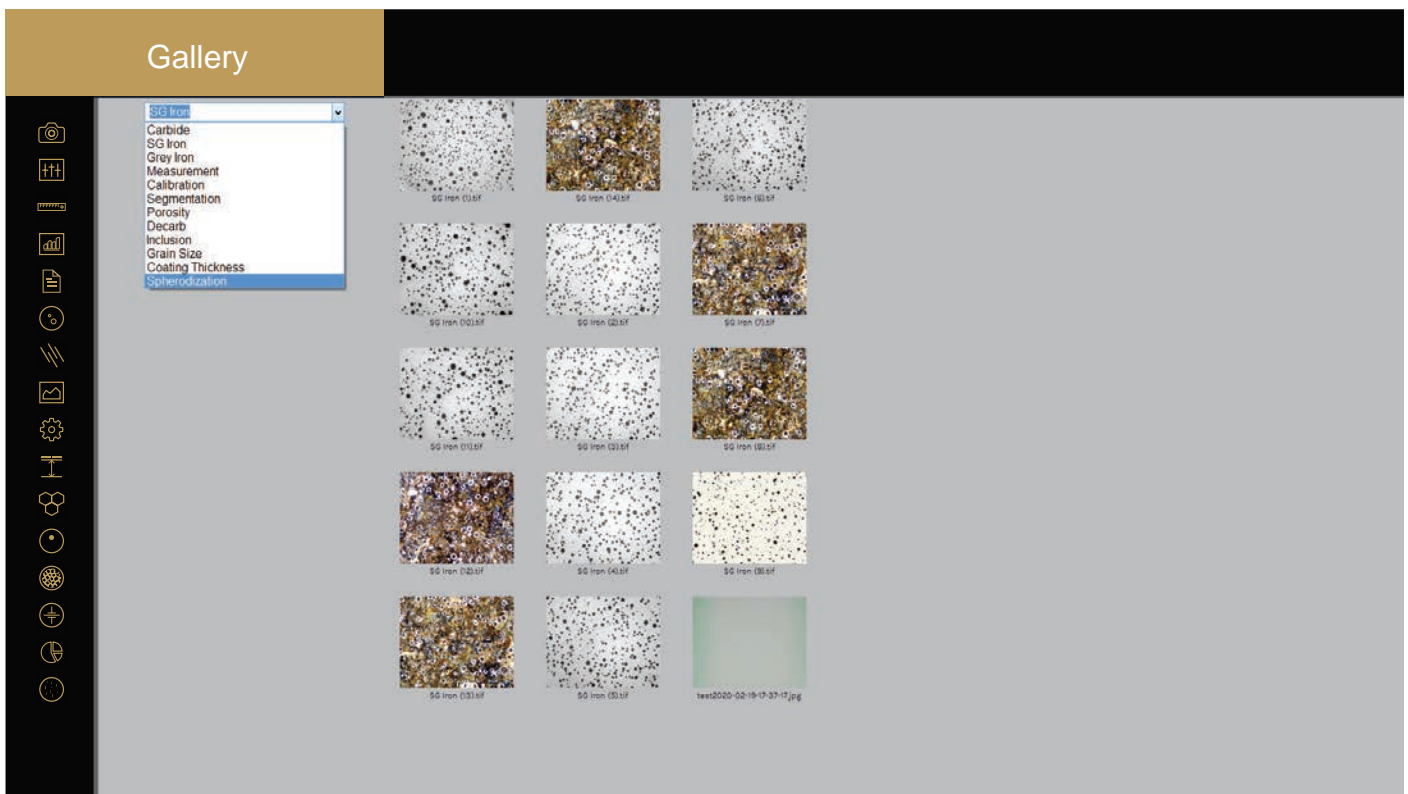
Software Interface

Save Report

All reports are saved in the folder and can be retrieve anytime in future.

Software Interface

Our Software being Exported to more than 20 Countries

UNITRON®