

chimera

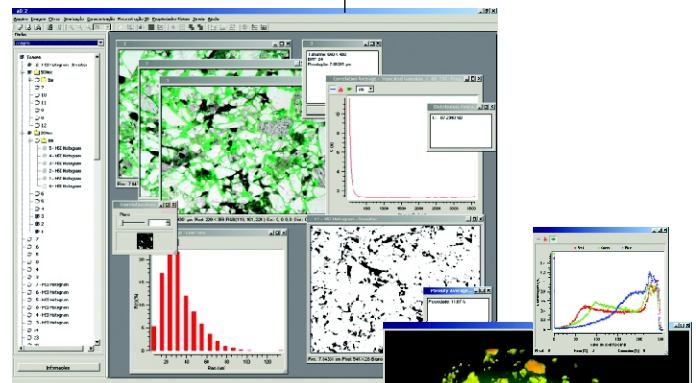
FOR IMAGE APPLICATIONS



CHIMERA is a technology developed by ESSS for the analysis and quantification of micro and macrostructure material properties. It supports importing images from different acquisition systems (optics and electronics microscopy, thermographic cameras, computed tomography, micro-tomography, laser scanning, ...) and file formats, and through data manipulation those derived from filtering, processing or mathematical modeling algorithms.

It is robust software designed to work with large data sets organized in a cognitive user interface where the tools can be easily applied to one or multiple sources. It supports the most standard processing functions and measuring algorithms over an expandable software architecture that can be extended or customized according to the needs of the user.

With these characteristics this software can be used as a image analyzer, or can be used as a based technology for development of complexes and customized applications. This customization is realized for a high quality ESSS' team, that has professionals with development experience of engineering applications that need high numerical processing and scientific visualization. This expertise is used mainly in oil&gas, metal-mechanic and aerospace segments.



Illustrative images

The main purpose of the CHIMERA technology is to process and analyze microstructure or macrostructure images, quantify and qualify information about their characteristics and estimate physical properties through simulation.

Applications

The great potential of technology CHIMERA is its robustness and the customization work done for the ESSS, which involves since software engineering until research and development of new methods, filters and module numerical that contributes for the solution of the problem. See samples below:

Oil&Gas application

Rock reservoir characterization

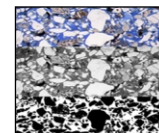
The determination of physical properties of reservoir rocks using image analysis just is a reality. It has shown an important technology to reduce the costs and to increase the speed that the information can be gotten.

The CHIMERA has resources developed especially for this segment, that allow the industry to analyze images acquired from thin rock layers and tomography computerized scans, as well as to extract these characteristics that will go to compose the reservoir or well data sets.

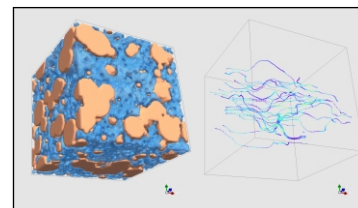
- Rock porosity
- Porous distribution
- Rock 3D media reconstruction
- Formations factor of porous
- Permeability simulation
- Capillare Pressure simulation
- Fluid invasion curve



Sample rock



2D optical images



3D reconstruction and simulation results

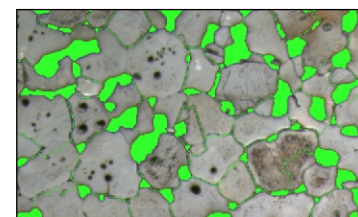
Mineral application

Magnesium sinter characterization

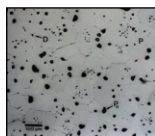
Magnesium sinter is a refractory material used in the industry for applications as coverings of internal walls of ovens. The industry has interest in crystal size distribution, parameter that will influence the thermal conductivity and the material resistance to corrosion. However, for the image analysis techniques the material pureness is a great barrier for the success of the crystals bordering detention, because the contrast between the edge and the matrix is almost inexistent.

Through CHIMERA basic tools use, added with specific and optimized development realized for this type of material, the ESSS developed a tool for MAGNESITA that has features to determinate the grains size distribution easily.

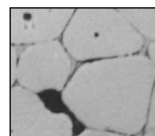
- Special tools for crystal countor determination
- Grain (crystal) size distribution
- Porous size distribution



Porous determination



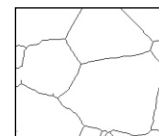
Sinter magnesium



Crystal contours



Segmentation



Contours detection

Metal application

Steel and iron characterization

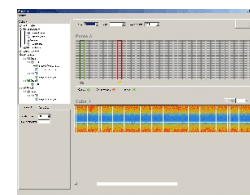
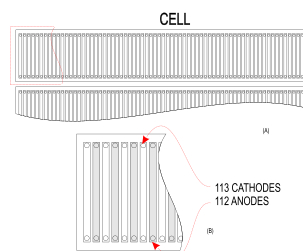
The metal industry needs much information about microstructure characteristics of materials that works. With this can monitor and improve the quality levels of the produced pieces. Through the CHIMERA technologies the ESSS creates some procedure for this industrial segment, between them:

- Inclusion classification (with Yawata method)
- Grain size distribution (ASTM)
- Linear gradient of invasion in tempering steel
- Steel grain recrystalization distribution
- Fraction phases, etc

Thermal application

Thermal monitor for electrolysis process

The ESSS developed a CHIMERA specialization to monitor and analyzed the temperature in zinc electrolysis process, based in infrared images. This system is connected in a FLIR infrared camera and processes the cathodes and anodes information of independent form. In such a way the user can know which process component is with the modified temperature.



GUI sample

Features

It supports importing images from different acquisition systems (optics and electronics microscopy, thermographic cameras, computed tomography, micro-tomography, laser scanning, ...) and file formats, and through data manipulation those derived from filtering, processing or mathematical modeling algorithms. See this features below.

Basic Environment

Import and export:

- 2D images: TIF, JPG, BMP
- 3D images: iD3, STL, DICOM, RAW volume data, Stacks of 2D images
- EnSight Format
- Import data of other projects

Resolution and Calibrate

Simple visualization of tables, plots, 2D and 3D images

Customized color scale

Statistics and reports

Multiple data source manipulation

Multilanguage System (English, Portuguese and Spanish)

Multiplatform support (Windows 2000/XP 32/64bits, Linux 32/64bits)

2D Manipulation and Processing

Arithmetic/Boolean operations (plus, minus, and, or)

Linear and nonlinear filters:

- median, high-pass, low-pass, Sobel, Canny, Smart bluer, Gaussian, Hough, Back Correction, Equalization, Label...

Phase Fraction

Morphological transformations:

- dilation, erosion, opening, extremity dilation, IDF D3-4, Gray Berd...
- Skeletonization (skeleton, cleaning and connect contour)

Threshold:

- Limier histogram (Gray, RGB and HIS), Neural Network, Variance, Entropy

Correlation (Spatial, Frequential, Connectivity, Length)

Convert to Gray and RGB; Invert; Split RGB and HIS canal; Crop;

Point Length; Inspect tools.

Histogram (GRAY, RGB and HIS)

3D Manipulation and Processing

Linear and nonlinear filters:

- median, high-pass, low-pass

Morphological transformations:

- dilation, erosion, opening, IDF D-3-4-5

Threshold:

- Limier histogram (Gray), Variance, Entropy

3D Reconstruction

- Truncated Gaussian, Spheres, SMPE and Stacks of 2D Slices Interpolation

Phase Fraction

Correlation (Spatial, Frequential, Connectivity, Length)

Arithmetic/Boolean operations (plus, minus, and, or)

Geometric operations:

- Image translation, image rotation, slices translation
- Tranverse section average

Bind of slices images

Export Slices (TIF, JPG and BMP format)

Inspect tools

3D Basic Visualization

3D View Settings

- Clip area, ROI, Color Scale, Threshold,
- Thumbs (slice, List, Columns and file list)

Rendering

Basic Visualization Processes

- Plane-Cut/Clip
- Iso-Cut/Clip
- XYZ Box Clip
- PropertySelection

Inspect Tool

Advanced Tools (2D, 3D and Plot)

Bernsen Threshold (structuring elements)

Watershed Threshold

Fit Curves (B-splines, polynomial, etc)

Characterization 2D Properties

Grain size: ASTM Lines Intercept, ASTM G,

Shape Factors:

- Area, Perimeter, Width and Height, X and Y projection
- Chord Maximum and Minimum, Radius, Hydraulic Radius
- Compactness, Heywood, Waddel, etc

Porous Distribution (based in morphology mathematics)

LGI (Linear gradient of invasion) for tempering steel

Steel inclusion classification

Iron Inclusion Classification

Characterization 3D Properties

Customized characterization properties rock reservoir

- Absolute permeability (FastK, LG Boolean, LG Boltzmann, MPS)
- Absolute relative permeability (FastK)
- Capillary Pressure: Mercury intrusion, Drainage, Imbibition and Water-Oil
- Formation Factor
- Resistivity index

Customized for Tomography Properties

- CT Density and CT atomic number
- CT Average Curve, Radial Profile
- Depth position
- Fluid Intrusion

CHIMERA owns a set of basic tools, as presented before, that can solve the problem in question alone or they may need some adjustments and/or the creation of new complementary tools. The creation of new tools and adjustments is called Customization, and it is performed by ESSS software factory team.