

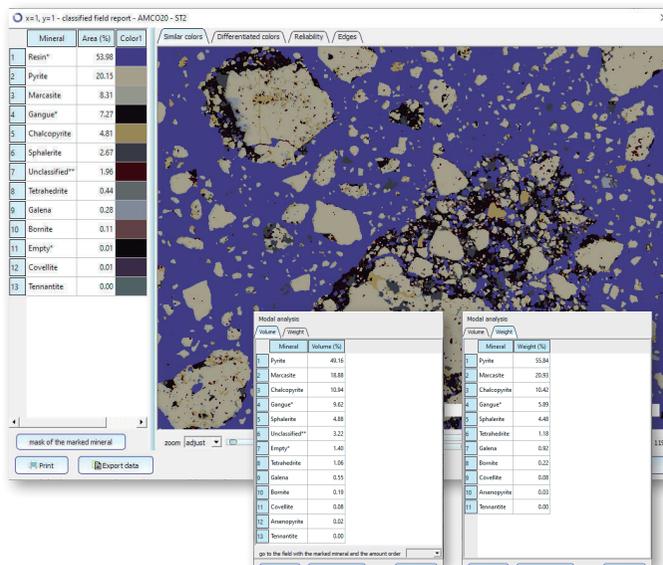
amcoCapture

- ✓ Controls all the elements of the instrument.
- ✓ Allows acquiring a series of multispectral specular reflectance images of fields of a polished section.
- ✓ The images can be captured one by one in manual mode, or automatically by the unattended scanning of the area specified by the operator on the polished section.
- ✓ Implements calibration procedures to ensure accuracy and reproducibility of reflectance measurements and a precise registration between all the image bands.

amcoAnalysis

- ✓ Allows to visualize the images of a series, and to perform different types of analysis on them.
- ✓ Minerals are identified by comparing their multispectral specular reflectance with a reference ore database.
- ✓ The automatic classification of all pixels in a series allows to obtain **maps** of the distribution of **mineral** phases in each field and **modal analysis** of the sample.
- ✓ On polished thin sections of milled ore samples prepared with fluorescent resin, it performs **particle size analysis**, as well as **modal analysis**, **liberation analysis** (both by exposed surface area and by composition) and **particle composition analysis**, all by particle size fraction

AUTOMATED MINERALOGICAL CHARACTERISATION OF METAL ORES BY REFLECTED-LIGHT MICROSCOPY



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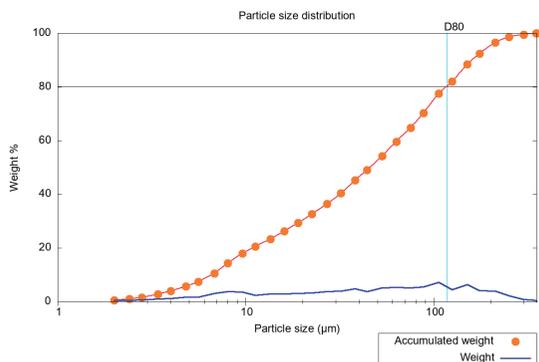
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MULTIESPECTRAL MICROSCOPIC TECHNOLOGIES

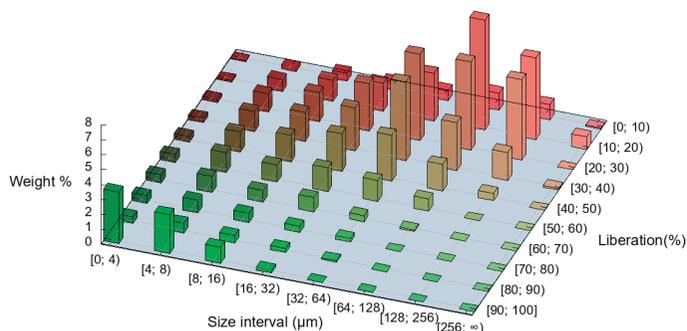
The optimization of processes for the industrial exploitation of mineral resources nowadays requires a quantified, precise and fast mineralogical characterization of these resources, a basic support for Geometallurgy. The reflected-light microscope has been notably relegated by "Automated Mineralogy" systems based on SEM-EDS (Scanning Electron Microscopy with Energy-Dispersive x-ray Spectroscopy), which are expensive, demanding in infrastructure and personnel and not always reliable, but offer high-performance.

However, automated optical microscopy can provide comparable performance (and even more reliable mineral identification, in some cases) at a much lower cost and without the need for a microscopy specialist. This is demonstrated by an innovative system called AMCO (Automated Microscopic Characterization of Ores), the result of a recent R&D upscaling project funded by EIT RawMaterials under the EU's Horizon 2020 programme.

The AMCO System is an optical microscopy system specially designed for the acquisition and processing of **multispectral images** composed of a number of specular reflectance bands spanning the **visible and near infrared (VNIR)** range of the spectrum. It consists of a specialized instrument based on a fully motorized **reflected-light microscope** incorporating several auxiliary elements linked to a computer, and two proprietary software applications:



Liberation by surface of Chalcopyrite + Chalcocite + Covellite + Bornite + Digenite + Djurleite



SYSTEM FEATURES

- ✓ Specular reflectance measured with non-polarized light.
- ✓ Spectral range of basic system: from **370 nm to 1000 nm**.
- ✓ Multispectral specular reflectance database includes over **100 ore minerals of industrial or economic interest**.
- ✓ Database can be easily expanded to include other minerals.
- ✓ Optional fluorescence band allows effective distinction of gangue and fluorescein-dyed resin, enabling particle analysis on polished thin sections prepared with milled ore samples.

ADVANTAGES OVER SEM-EDS SYSTEMS

- ✓ Much lower cost and infrastructure requirements.
- ✓ Does not require specialized personnel for its operation.
- ✓ Can reliably **identify polymorphs** and mineral phases having identical or very similar composition that cannot be distinguished by SEM-EDS (e.g., pyrite/marcasite, digenite/chalcocite/djurleite, magnetite/hematite, enargite/tennantite/luzonite, graphite, etc.)
- ✓ Lower percentage of unclassified pixels.

PARTICLE ANALYSIS FEATURES

- ✓ **Particle size distribution** of the sample, expressed as weight % for each particle size interval. Cumulative values and D80.
- ✓ **Modal analysis**, by particle size intervals.
- ✓ **Liberation analysis by % of exposed surface area** (i.e. degree of surface exposure, calculated as % of the perimeter occupied by the mineral) on particles containing a given mineral -or group of minerals- of interest, distributed by particle size intervals.
- ✓ **Liberation analysis by weight % composition** (i.e. liberation grade, computed from the composition of particles) on particles containing a given mineral -or group of minerals- of interest, distributed by particle size intervals.
- ✓ **Particle composition analysis** (expressed in weight %) of each of the minerals or mineral groups defined according to the type of particle (single-phase, binary with another mineral group and multi-phase).