

CAMEVA. Automated system for the microscopic characterisation of ores using machine vision

Automated system of multispectral microscopy for the characterization and quantification of metal ores

The CAMEVA system is based on an optical microscope in reflected light, specially adapted for allowing the acquisition of multispectral reflectance specular in the band is visible and near-infrared, associated with a vision system that implements procedures of calibration, acquisition and correction ensuring Imaging in units of absolute reflectance with a perfect record among the different bands. This allows to recognize the metal ores in a sample with high reliability, without the intervention of an expert. It constitutes a breakthrough in the field of the geometallurgy because it provides information comparable or even complementary to the SEM (scanning electron microscopy) systems that are more advanced at a fraction of their cost, faster analysis and environmental requirements and less demanding sample preparation.

Technology solution supported by the Technical University of Madrid

Technology solution

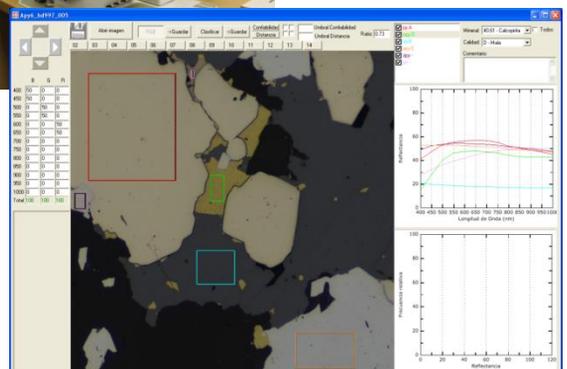
The CAMEVA system is based on a specially adapted reflected light microscope that allows the acquisition of multispectral specular reflectance in the visible and near-infrared bands, which are associated to a system of vision that implements some procedures of calibration, acquisition and correction. These ones could guarantee the obtaining of images in units of reflectance absolute with a perfect record between the different bands.

This allows to recognize the metal ores in a sample with high reliability, without the intervention of an expert. It is a breakthrough in the field of the geometallurgy because it provides comparable information to those more advanced scanning electron microscopy systems at a fraction of their cost.

Areas of application

- **Energy:** ICT applied to environment friendly and energy efficiency.
- **ICT:** applied to robotics and cognitive systems.

"Optimize the exploitation of mineral resources, while safeguarding the environment"



Market demands

▪ Energy

- SEM (scanning electron microscopy) systems that are currently used for the characterization of ores have such a high price and high environmental requirements that they are only available to large mining companies and some universities. This system would have less strict environmental requirements and a lower cost, so it would be possible to use it in a large number of medium or small size companies and universities, even in developing countries. It provides a tool for a systematic quantitative analysis of ores, which would optimize the use of mineral resources, improving energy consumption and decreasing possible harmful effects on the environment.
- There are currently about 300 SEM systems worldwide, and the market is nearly saturated.
- This system estimated price would be three to six times lower than current ones; their market potential should be at least five to ten times higher.

▪ ICT

- The proposed system could be adapted to characterize other types of materials characterized by its reflectance or even its transmittance; this broadens its scope of application

“CAMEVA

provides a solution to the characterization of ores in mining companies or universities that are located, for instance, in developing countries”

Market potential

▪Power

- If we consider a "high price" of 120 k€ for the proposed system (including hardware and software), and the hypothesis that competitors SEM systems are kept in the same order of price that currently have (≈500 k€), it could be estimated a market of about 150 systems (≈5 - 10% of the potential market) in five years, with a total of 18 M€ turnover.
- If we consider that new low-cost desktop systems SEM will incorporate in the future the ability to do analysis of ores, price would be reduced (≈80 k€), the market will be reduced considerably, since it would be considered as a complementary system (and not alternative one) to the MEB. Estimated market: 60 systems, 4.8 M€ total turnover.

Competitive advantages

- Much lower cost than the classical SEM systems (QEMSCAN, MLA).
- Capacity to clearly discriminate minerals of similar composition (for example: iron ores) that are not distinguished by SEM systems.
- Faster analysis.
- Much less restrictive environmental requirements.
- Easier samples preparation.
- Capacity for learning new minerals by the user, without having to make major configuration changes.

References

- Project in collaboration with UPM and AITEMIN.
- Financed by the National Plan of R+D+i of the Ministry of Education and Science (CGL2006_13688_C02_01).
- Prototype of the system in use at the Laboratory of Applied Microscopy and Image Analysis (UPM) for the study of ores from several mines.

IPR

- Patent granted in Spain ES2368321

Development stage

- Concept
- R & D
- Lab Prototype
- Industrial Prototype
- Production

CAMEVA contact

Prof. Ricardo Castroviejo
e: ricardo.castroviejo@upm.es
Juan Carlos Catalina
e: jc.catalina@alumnos.upm.es
http://www.minasyenergia.upm.es/laboratorio/microscopia_aplicada

UPM contact

Innovation, Commercialization and Entrepreneurship Area
Centre of Support for Technological Innovation – UPM
e: innovacion.tecnologica@upm.es