# HyperMOS

## Use of Hyperspectral Cameras as an Extension of the Mineral Optimization System

To meet the growing global demand for raw materials, mining must become more efficient, but also climate-neutral and more environmentally friendly. At the same time, deposits are becoming increasingly complex, and the content of valuable materials is declining. By optimizing mining planning in real time, selective extraction can be achieved, thereby addressing several challenges at once: by reducing uncertainty and imperfections in information, mining planning can be better and more quickly adapted to complex deposit conditions and the extraction of waste rock can be reduced, which can lead to increased energy efficiency and ultimately lower costs or, conversely, a reduction in the cut-off grades of a deposit.

A few years ago, Castalytics developed the ‘Mineral Optimisation System’, which automatically generates a mining plan from the 3D data of the deposit. This enables selective extraction, minimizing the amount of waste rock extracted. Evolutionary or genetic algorithms are used in combination with simulated annealing for this purpose. The data used by this software typically comes from core drilling, which is both costly and and rather sporadic.

As an alternative to core drilling, this project deals with the use of hyperspectral cameras, investigated by the AMT, and LIBS, investigated by IFNANO, in underground areas. Hyperspectral cameras measure not only the intensity of red, green and blue light, but also numerous of wavelength ranges. Under a known light source, the exact reflectance of a mineral composition can be calculated and thus identified. Wavelengths in the visible to infrared range are often used to characterise materials in mining, as most minerals exhibit clearly distinguishable behaviour in these ranges. LIBS enables to determine the elemental composition of a sample. Alaser is used to vaporise a tiny part of the material, and the resulting plasma emits light whose wavelengths and intensities are measured and analysed using spectrometers.

The advantages of using hyperspectral cameras are its real-time capability and low variable costs. On the other hand, challenges include the high computing power required to process the hyperspectral image and the complexity of spectral analysis. In addition, a typical challenge in mining is to protect the system against harsh conditions. A suitable light source for hyperspectral imaging must be integrated into the system for underground use, as there is no natural light available there.

back to top