



CHALLENGING LIGHT
FOR OUR PARTNERS

LIF-RAMAN: MINERAL AND ROCK COMPOSITION

Current analysis instruments provide valuable mineral information but often require proximity with a rock surface, direct contact or even sample acquisition. To alleviate these constraints, INO has developed an instrument capable of analysis from a distance without the need of sample preparation or acquisition. Based on optical fluorescence and Raman properties of molecules, it thus complements the information that X-ray devices give about the elemental composition of rocks. The developed technology offers rock sorting capabilities and helps geologists to figure out the mineral content of outcrops or drift walls in mining exploration or operations. It can be made into a handheld, light-weight device that can be used directly in the field. Moreover, the analysis can be performed in a short time.

KEY APPLICATIONS

- For exploration from remote location of outcrops, mountain, open pits, drifts, etc.
- In blasting drilling holes
- On conveyor belts
- In scoop or trucks
- At crushers
- Soil contamination assessment (e.g. dusty contaminants, hydrocarbons, etc)

ADVANTAGES

- Remote detection in hazardous places (e.g. gallery & cliffs);
- Remote detection without sampling
- Possible handheld device deployable in the field
- Possibility of airborne systems for fast scanning of large areas
- Gives info on molecular composition (complementary to XRF systems)



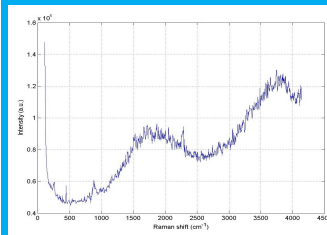
LIF-Raman Prototype

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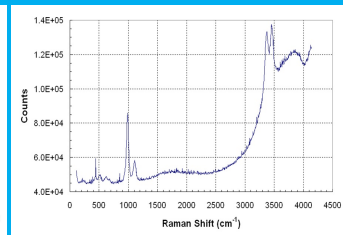
CLASSIFICATION

Raman spectra of minerals or mineral mixtures reveal fine features without any excessive overlap. Raman spectroscopy has thus the merit to identify minerals unambiguously, not only to determine a class of minerals but also to identify specific species based on a careful interpretation of the peaks. This is done by comparing results with known standards and databases. This approach is particularly attractive for mining exploration and operation since different mineral formations generate distinct Raman spectra. The addition of laser-induced fluorescence can provide additional qualitative information on the mineralogy of samples, particularly to identify gems or rare earth elements. This represents a practical tool for field use.

EXEMPLES OF RESULTS



Hematite LIF-Raman Spectrum



Selenite LIF-Raman Spectrum

COMM-110019

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INO'S SOLUTIONS

INO is the largest center for industrial optics and photonics expertise in Canada. As a leading technology developer and provider, INO is home to the largest concentration of skills in the field in Canada. Over the years INO has developed many technologies that can bring solutions to some problems in the mining industry.



VISI +: VISIBILITY ENHANCEMENT

This system is a camera with an invisible illumination that provides an enhanced image of the environment in adverse conditions such as fumes, dust, fog, snow, blizzards, etc. It can be used by mine rescue teams, emergency vehicle drivers, and ice road convoys.



3D LASER PROFILER: DRIFT AND ROAD SHAPE MONITORING, ROCK SIZING

INO has developed multiple systems based on its 3D laser profiler over the last 15 years, among which are road profilers that can operate at speeds of 100km/hour. This technology could make it possible to scan drifts in 3D at mm resolution and yield realistic information on drift shape and material inventory. This could also be used for sizing rocks running on conveyor belts, in scoops or dump trucks.



HYDRA: REMOTE DUST MONITORING

This system offers the ability to monitor, map, and measure the flow of particles dispersed in the air or in water in real time. It can then be used in mining applications to monitor stack plumes. It could also be a tool to help manage dust emissions from drilling processes or heavy vehicles in open pits. It is well suited to help shed light on and control environmental problems related to fugitive aerosol emissions.



LIF/RAMAN: MINERALS AND ROCK COMPOSITIONS

This technology could have applications for rock sorting or be used as a tool to help geologists figure out the mineral content of drift walls in mining exploration or operations. It is based on optical fluorescence and Raman properties of molecules and thus complements the information that X-ray devices give about the elemental composition of rocks. It can be made into a handheld device that can be applied directly in the field.



HYPERSPPECTRAL CAMERA: ROCK COMPOSITION

Hyperspectral cameras combine the power of spectroscopic analysis with vision analysis by collecting and imaging the reflectance spectra. This technology has emerged in recent years as a superior alternative to color and black and white vision systems, both of which have a limited capability to discriminate materials of similar colors and tint. What sets INO's hyperspectral system apart is its ability to handle fast-moving material such as rocks moving on a conveyor belt at up to one thousand feet per minute.

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INO'S OFFERINGS

- > PROTOTYPING
- > SHORT RUN PRODUCTION
- > TECHNOLOGY TRANSFER