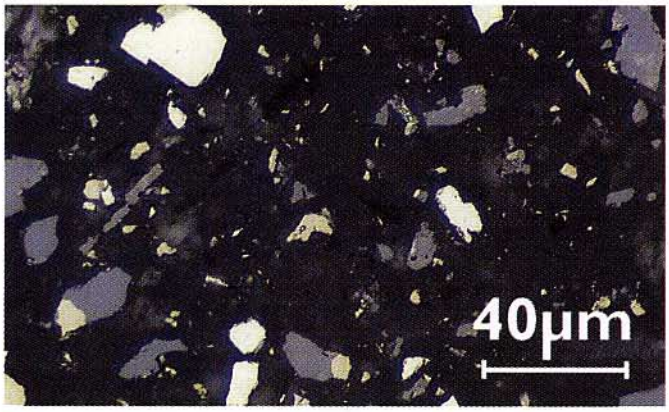
Automated image analysis for ore petrography

Finding the right technological tools to reduce costs and achieve maximum output is one of the major components in maintaining a healthy position in the marketplace.

Mineralogists at **SGS-Lakefield Research** (Lakefield, Ont.) use an integrated approach that combines petrographic, image analysis, scanning electron microprobe and QEMScan technologies to investigate ore mineralogy and textural relationships amongst other applications. As a key element in their approach, image analysis technology is revolutionizing the ways in which morphological characteristics of minerals are quantified. Modern analysis minimizes the amount of time needed for manual procedures.

Geoff Lane, Project Mineralogist at SGS-Lakefield Research, is responsible for overseeing various projects that help evaluate optimal extraction and processing techniques. One common application he frequently deals with is the textural and mineralogical analysis of base metal ores containing, for example, copper and zinc. For modal abundance and liberation analysis of concentrates and tails, Lane uses **Clemex Vision** (Montreal, Que.) image analysis software to assist in discriminating among mineral phases optically, and provides area and liberation percentages for each mineral phase.

Typically, samples undergo a number of metallographic preparation steps that may include sectioning, mounting, grinding and polishing. Samples are then placed on the motorized microscope stage for inspection. From a pre-established or custom-designed image analysis routine, a list of sequential instructions is executed to extract the desired mineralogical and textural information. A standard image analysis routine will include three distinct categories of instructions including image acquisition, processing and measurement.



This polished section of a flotation concentrate allows mineralogists to identify sphalerite (grey) and chalcopyrite (gold), and measure area and liberation percentages.

The main challenge in the project illustrated in the figure was to isolate sphalerite and chalcopyrite, and measure area and liberation percentages. With the use of a Sony DXC-950P high-resolution camera mounted on a Nikon Optiphot 150 microscope, images were acquired using Clemex Vision image analysis software. Lane designed a routine that first binarizes the image using colour thresholding techniques in order to distinguish the mineral phases including sphalerite and chalcopyrite. Subsequent instructions automatically remove unnecessary artifacts. Area measurement parameters are then inserted along with advanced instructions, referred to as "child (inclusion) counts", to determine the number and percent of liberated grains versus locked or attached grains. Once complete, raw data are then presented in the form of a spreadsheet-like data browser with summary statistics displayed in histogram format. Particular metallurgical data are obtained and reported with the use of charts, graphs and photomicrographs.

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Circle Reply Card No. 110

Cameco engages the front-lines to achieve record production

Cameco Corp.'s Key Lake operation in northern Saskatchewan partnered with business coaches from **RLG International** to implement a performance improvement program that significantly reduced costs and improved processes. By challenging its front-line employees to build a better system, the world's largest uranium producer achieved a record production of 18.7 million pounds of high-grade ore in its first year of the program. This combined with the improvement initiatives, resulted in a 37% decrease in the unit cost per pound of uranium.

RLG and Cameco developed leadership and management practices that focus on expanding front-line employee involvement. Voluntary cross-functional teams were formed around identified cost areas, and have saved $5.8 million to date. Teams identified processes to be streamlined and were given autonomy to make their own decisions.

A management sponsor was assigned to each team to insure proper support and encouragement. In addition, RLG relocated a team of coaches to Key Lake to assist with implementation.

Cameco's operations general foreman Craig Lapointe said, "Because of the work with RLG, I know that the circuit operators are more in tune with what we want to achieve. The increased awareness, the front-line improvements to processes and the focus on the key performance indicators can be directly seen in a number of key areas. Recovery surpassing 99% is just one example of RLG's impact."

Circle Reply Card No. 111

Explosives merger planned

Dyno Nobel ASA of Oslo, Norway, and **Ensign-Bickford Industries, Inc.** (EBI) of Simsbury, Conn., have signed a letter of intent to merge their explosives capabilities. Both Dyno Nobel and The Ensign-Bickford Co. (EBCo), a subsidiary of Ensign-Bickford Industries, Inc., have a major presence in blast-initiation systems and specialty blasting products. Dyno Nobel, as one of the world's leading explosives companies, also manufactures and markets a full range of explosives products and services.

The merger is expected to close during the second half of 2002. The merged company, headquartered in Oslo, will have annual revenues of almost US$900 million and operate in 36 countries. The current initiation systems business activities of both companies with the exception of EBCo's Spanish Fork, Utah, facility will be merged into a single Initiation Systems Business Unit to capture the ongoing success of both companies in this area.

This merger will result in a world-class competitor in the explosives industry with particular emphasis on technical leadership in initiation systems, explosives products including ammonium nitrate capabilities, and delivery systems. The new organization will be well positioned to deliver integrated customer solutions.

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