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Better understanding is all part of the process

Materials characterisation is often the starting point for many process improvements and developments.

Knowing the chemical composition, the mineralogy or phase make-up of a material and the textural relationships, the microstructure, porosity and surface area as well as the macrostructure and crystal structure provides a starting point for understanding the potential for improved processing of the material – whether it be for improved recovery, better rejection of unwanted components, less reagent use, lower energy consumption, or greater availability of a unit process.

This applies equally to raw materials, consumables, intermediates, waste products and the value-added product of the process, as well as to special materials of construction such as refractories.

CSIRO Minerals has long recognised this and has built up a strong in-house capability in laboratory-based techniques for materials characterisation, including unique software such as CHIMAGE for interpreting microprobe and scanning electron microscope EDS and WDS data, and Reitveld software for interpreting X-ray diffraction data.

This capability is in addition to our range of analytical instruments developed for the minerals industry, such as the on-line Low Frequency Moisture Analyser, UltraPS particle

**COMMENT**

By Dr John Rankin,
Acting Chief, CSIRO Minerals

size analyser and UltraPF mass flow analyser, and our off-line QEMSCAN quantitative mineralogy system.

While this in-house characterisation capability is world class, what we believe is unique is the in-depth process understanding our researchers bring to the interpretation of the characterisation data, which enables the solution of very difficult processing and operational problems and development of new processing routes.

Some of the stories in this issue of *Process* illustrate how we have helped solve a number of processing problems through developing a better understanding of a material and the processing implications.

CRC's goal is to reduce environmental impact

Q: WHAT ROLE WILL MATERIALS CHARACTERISATION play in achieving the goals of the new Centre for Sustainable Resource Processing?

A: The overall goal of the centre is to greatly reduce the ecological impact of minerals processing while meeting the material needs of society.

Much of our work on improving the industry's environmental sustainability will focus on what goes in and what comes out of minerals processing. More accurate minerals characterisation helps the industry to become more efficient in reducing non-mineral inputs, particularly energy and water, to the benefit of the environment.

LEADER'S FORUM

Stevan Green,
CEO, CRC for
Sustainable Resource
Processing

In addition, we will be working on new ways to turn by-products into useful co-products – converting waste into a valuable resource. Minerals characterisation of slag heaps, waste heaps and tailings dams will identify what materials they contain, so that we can explore how they can be reused. These co-products could become a source of valuable minerals or, for example,

provide soil conditioners for reclaiming degraded land or potentially be used in polymers or concrete.

Materials characterisation is typical of the high-technology nature of the minerals industry that we hope will attract a new generation of scientists. This ties into the educational role of the new centre. In the next seven years, we expect to sponsor more than 50 post-graduate students and we are looking ahead at attracting some of the brightest high school students into the right undergraduate courses for starting careers in the industry. To be sustainable, the minerals industry will need the best minds to focus on these issues now and in the future.