MINERALS HISTORY

FOUNDATIONS OF THE future

By GIO BRAIDOTTI

TEN years ago, two CSIRO divisions with proud histories going back decades – the Division of Mineral Products and the Division of Mineral and Process Engineering – officially merged their expertise, people and vision to create CSIRO Minerals.

The division's Deputy Chief, John Rankin, recently took the opportunity to look back, consider the achievements and discuss the key issues for the future.

Over the decade, the merger saw staff converge geographically on new sites, a move Dr Rankin praises. "It helped to integrate the strengths of the two divisions – chemistry and characterisation capabilities, on one hand, with chemical and process engineering. This has enabled Minerals to make critical connections between fundamental science and industrial applications with a high impact for Australia."

It is this bridging role that Dr Rankin enjoys most about the division: "An important achievement is how well Minerals has aligned its research efforts with the needs of Australian industry to address major issues to do with the processing of important commodities such as iron ore, bauxite, gold, mineral sands, copper and nickel."

Resolving the pressures between environmental and commercial needs is one of the most important long-term issues facing the minerals industry, Dr Rankin says, and he believes this is an important area for the division. "Research is needed to resolve the tension between meeting an increasing global demand for materials and the environmental and social impact of their production and use. The division needs to play a leading role embedding sustainable development in all aspects of meeting the material needs of the world."

He thinks the division has already made progress in this direction. "We played a key part in the Green Processing Conferences (in 2002 and 2004) as co-organiser with the Australasian Institute of Mining and Metallurgy, and in establishing the Centre for Sustainable Resource Processing.

"We also took a pro-active role in establishing the Light Metals Flagship, which will produce important environmental as well as economic benefits for Australia."

A new area of research is aimed at reducing wastes by using them in other processes to extract their value.

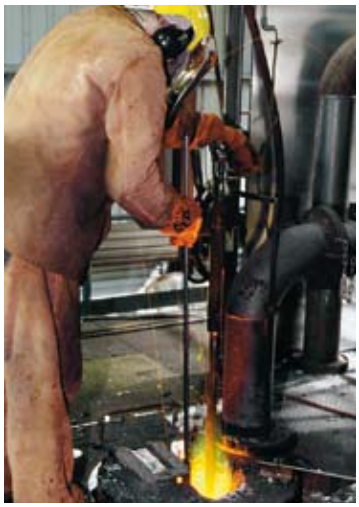
"One approach is to mimic ecological systems and their ability to regulate and recycle the flow of materials with no toxic build-up of wastes," explains

The sweet smelt of success

One of the high points in the history of CSIRO Minerals was the invention of a highly original form of metal smelting known as SIROSMELT. Developed in the 1970s, SIROSMELT was at the forefront of a new generation of intensive, highly efficient bath smelting reactors, explains Senior Project Scientist Michael Somerville.

"The process involves the swirled injection of air (and oxygen), and fuel into a slag bath using a stainless steel lance or pipe. In this way two things occur.

"First, a solid slag layer forms on the outside of the lance which provides protection against the aggressive molten slag. Second, the submerged combustion creates highly mixed conditions, which enhance mass and heat transfer within the bath. The SIROSMELT reactor has a high productivity for its volume, which can lower the required capital costs for a given production rate."



Terry Hall sampling molten slag from the SIROSMELT vessel.

PHOTO: CHRISTIAN PEARSON

Ausmelt and Xstrata Technology (ISASMELT) have both commercialised the SIROSMELT technology. Today, with 35 furnaces in 23 locations in 14 countries, it processes about six million tonnes of material a year, and CSIRO scientists continue to enhance its capabilities.

"Recent modifications trialled at CSIRO include the installation of side tuyere which can be used to inject fine solid materials into the slag bath," says Mr Somerville. "An induction base has also been developed to provide additional heating to the reactor. This capability is especially useful to control temperature during slag reduction processes."

Given SIROSMELT's capabilities in recycling hazardous wastes and improving efficiency in conventional metal production processes and environmental performance, the adoption of this technology worldwide can only continue to grow.

– GIO BRAIDOTTI