FINAL PROJECT SUMMARY

Real-time Fluorine Mineral Identification using Novel Fluorescence Technology

Project number:	P1-014
Program Coordinator:	Greg Wilkie
Project Leader:	Nigel Spooner
Timing:	July 2019 to March 2021
Participants:	University of Adelaide, CRC ORE

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PROJECT OUTCOMES

The project brought learnings from P1-005, from lab-based analysis to prototype construction.

A full-scale prototype to detect fluorapatite and fluorite in ore samples was constructed and tested. The prototype enables real-time, cross-belt analysis of primary fluorine minerals in ore. Analysing changes in fluorescence under different excitation conditions allows discrimination of mineral type.

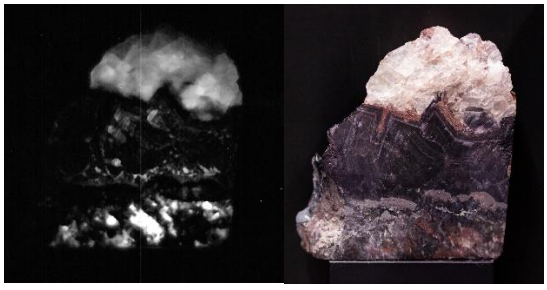
Project P1-014 took novel fluorine-mineral sensing from TRL 1 to TRL 4, and opened opportunity to create new sensors specifically for critical materials.

RESEARCH COLLABORATION

The project was performed in collaboration with Scantech International Pty Ltd, a METS company with extensive experience in the prototyping, construction and testing of cross-belt scanning systems. The workshop at Scantech allowed for testing of a full-scale system in a more realistic environment outside of the laboratory, including exposure to significant light, dust, and industrial electronic noise. Research at Scantech found that the prototype was tolerant to dust and vibration, and quantified the requirement for shielding of ambient light.

Collaboration with Scantech allowed testing on ore samples that had been tested previously on commercial cross-belt sensors. Using large samples of ore enabled tests for ore-to-ore variability checks, and presentation effects.

This project has provided the data enabling design of an advanced prototype targeting TRL 8, which is the subject of a collaborative CRC-P grant application.



Fluorite in ore: LHS, IR fluorescence, RHS, visible light photograph

BACKGROUND TO THE PROJECT

The project identified two fluorescence signatures detected in P1-005, from fluorite and fluorapatite, with potential to be used in the field due to their occurrence in all observed samples. A prototype real-time cross-belt sensor was designed, utilising two excitation wavelengths in order to discriminate between fluorite and fluorapatite signals in the same detection wavelength range.

The design aim was to allow optical excitation across the full belt width, and modular adjustment for belt size. Off-the-shelf excitation and detection systems were assessed and purchased, and the prototype was initially constructed and tested at The University of Adelaide. After initial tests on mineral specimens, it was relocated to Scantech International for testing in a more realistic environment above a static cross-belt assembly.

Prototype undergoing testing at Scantech International Pty Ltd

CRC ORE Optimising Resource Extraction

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