PROGRAM 1:
DEFINE

Upconversion fluorescence of minerals for geo-sensing

PROJECT P1-005

To develop a new, laser-based technology for detecting and quantifying mineral species in real-time for coarse particles.

The progression from TRL2 to TRL5 initially requires construction of a lab test facility to determine conditions and parameters for inducing Upconversion Fluorescence (UF) in the field from minerals of interest. The results of characterisation tests will then guide design of a TRL5 device, which will consist of a computer-controlled field testing device tuned to the relevant wavelengths for inducing UF from the target minerals, including UF collection optics and detection system.

Research collaboration

The University of Adelaide Institute of Photonics and Advanced Sensing (IPAS), and School of Physical Sciences have a high level of expertise in lasers and optics, luminescence, spectroscopy and computer control of apparatus, data collection and analysis across a wide range of industrial applications. As well as the state-of-the art facilities at IPAS, researchers have access to the teaching and research collections from the South Australian Museum.

The project is led by Adjunct Professor Nigel Spooner and involves Professor David Ottaway and two RHD students. CRC ORE provides additional leverage through the collaborative relationships established between University of Adelaide, University of Tasmania and several of CRC ORE's METS participants.

Program Coordinator:	Paul Revell, CRC ORE
Project Leader:	Adjunct Professor Nigel A. Spooner
Timing:	2016 – 2019
Participants:	University of Adelaide. Potentially involving several of CRC ORE's METS participants

Image: The Edinburgh Instruments Spectrofluorimeter is a powerful analysis tool ideally suited for analysing emissions detected in the proposed detection system. It is the first element towards creating the UF facility.

Background & aims

Laser-based sensing technology is a rapidly evolving field and recent advances in other industries and non-mining applications are revolutionising the possibilities of decisions based on real-time data. Adopting and aligning approaches developed in fields such as biomedicine and telecommunications has the potential to equally transform aspects of the mining industry. CRC ORE and the University of Adelaide are examining the potential for using novel physical properties, detectable through modern laser technology, to generate a new type of robust mineralogy sensor. The proposed method is expected to be less sensitive to the known limitations of existing techniques such as LIBS and LIF.

The project will create a new and unique mineralogy 'spectral fingerprint' database and will lead to the rapid development of new, low-cost, robust sensing technology capably of being applied in a range of mining and mineral processing applications..

Focus on outcomes

- Establish a world-first upconversion fluorescence mineral research facility.
- Develop testing, measurement and mineral characterisation protocols.
- Create and publish an upconversion fluorescence spectroscopic mineralogy database.
- Investigate potential upconversion fluorescence mineral identification and quantification application across multiple particle sizes and multiple industrial applications.

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Business Cooperative Research Centres Programme

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