Mineralogical Characterisation in a Cross-Belt Scanning Setting using LIBS Technology
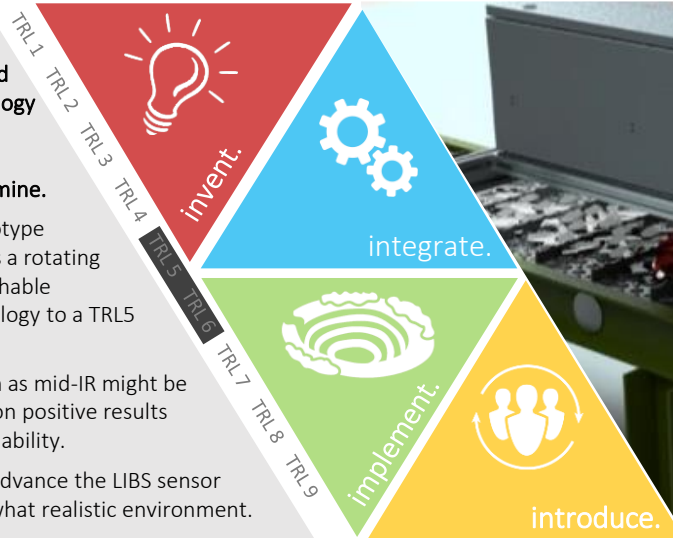
PROJECT P2-006

This project aims to adapt Laser Induced Breakdown Spectroscopy (LIBS) technology for rapid on-line mineralogical characterisation suitable for cross-belt scanning setting at the BHP Escondida mine.

In order to meet this objective, a prototype system will de designed which includes a rotating or moving table equipped with a detachable LIBS sensor unit to advance the technology to a TRL5 readiness level.

Other complementary techniques such as mid-IR might be introduced to the project, contingent on positive results from P2-004 and time and budget availability.

This project's ultimate goal is then to advance the LIBS sensor unit to TRL5 readiness level in a somewhat realistic environment.

TRL1 TRL2 TRL3 TRL4 TRL5 TRL6 TRL7 TRL8 TRL9

invent.
integrate.
implement.
introduce.

Project Scope

This project relates to a novel new implementation of LIBS mineralogical characterisation. It is based on positive outcomes of project P2-004 (Phase 1) to demonstrate performance of a new prototype applicable to a cross-belt scanning setting on the Escondida mine site.

This work is being covered in two phases:

- Phase 1: Review of the Escondida's test track engineering and process criteria; perform a preliminary architecture and design of the system; and comparison of design criteria to Phase 1 conclusion.

- Phase 2: Perform detailed optical and optomechanical design of the LIBS module.

Upon completion of this project it is aimed to advance the sensor technology application to TRL5.

A subsequent project (phase 3) will then deploy the LIBS sensor on Escondida's test track for further validation in a realistic environment on a dedicated test track.

The shipping, commissioning and field trial campaign of the LIBS sensor unit at BHP Escondida are excluded from project P2-006 and will be covered as part of Phase 3 (Utilisation).

At the end of Phase 3 the sensor technology will reach TRL6.

Program Manager:	Greg Wilkie, CRC ORE
Project Leader:	Daniel Gagnon, NRC
Timing:	March 2019 – June 2020
Participant:	National Research Council Canada (NRC)
Deposit Type:	Copper

Image (top): Example of LIBS cross belt for scrap sorting

Project Outcomes & Learnings

A positive project outcome would generate a TRL5 application of LIBS for mineralogical characterisation in a simulated environment at the point of origin (Canada).

In order to create a somewhat simulated environment, a rotating or moving table, capable of handling sufficient amount of samples equipment with a LIBS sensor unit will be constructed. Ultimately, the sensor unit will be made ready to test in a field deployment in a cross-belt scanning setting on the BHP Escondida test track.

The sensor technology will reach TRL6 at the end of Phase 3 and this prototype would be of potential commercial interest to a range of METS companies.
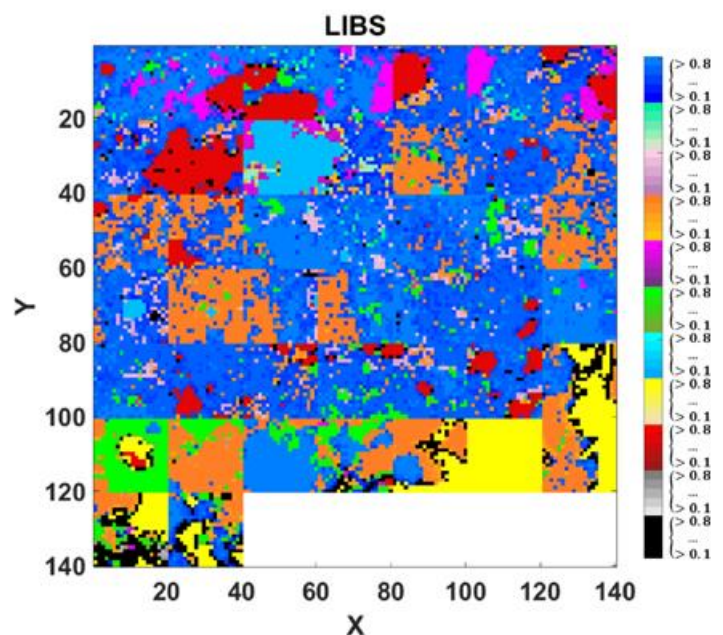

Image (above): LIBS mineral abundance image of the calibration set for 10 mineral phases