

LASER-INDUCED BREAKDOWN SPECTROSCOPY: A STEP CLOSER TO ON-LINE QUALITY CONTROL OF SLAGS?

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LASER-INDUCED BREAKDOWN SPECTROSCOPY (LIBS)

Is an analytical tool to determine the elemental composition of materials. The technique is based on a plasma induced by a **pulsed laser**. The laser pulse is focused on the sample surface using mirrors (M) and focusing lenses (FL). The sample (S) heats up locally and starts boiling and evaporates, generating a **plasma**. Its irradiation is recorded using a spectrometer and detector (D), resulting in a **fingerprint of the material's elemental composition**. Using standards, the signal can be used for quantification.

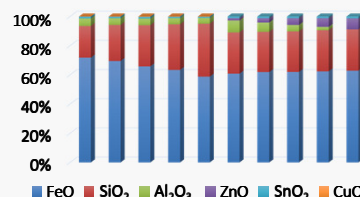
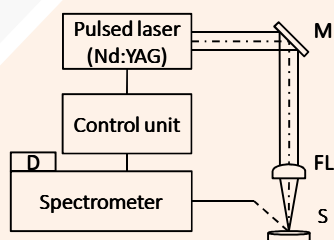
ADVANTAGES

- Independent of physical state of sample
- No sample preparation required
- Real-time measurements
- Remote analysis

DISADVANTAGES

- Matrix effect
- Quantification requires **standards**

SETUP

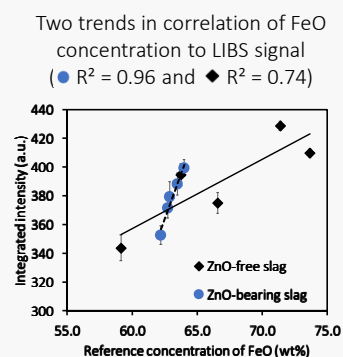
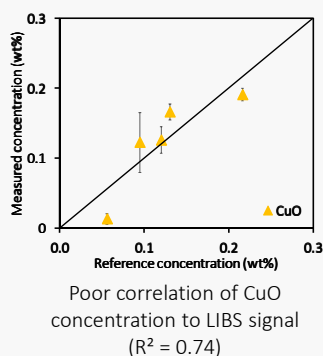
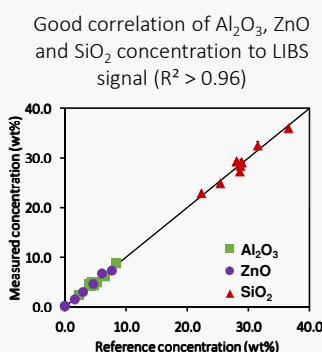


Normalized composition of the synthetic slags measured using EPMA-WDS (wt%)

SYNTHETIC SLAGS AS STANDARDS

UNIVARIATE CALIBRATION

Intensity of emission lines vs. concentration

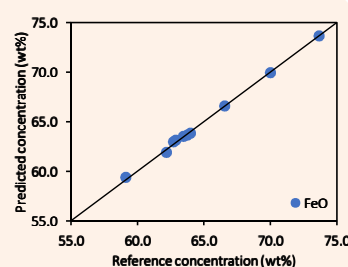
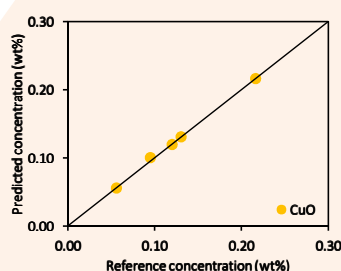


CONCLUSION

Univariate calibration suffices for SiO_2 , Al_2O_3 and ZnO

Multivariate calibration needed for CuO and FeO to reduce the matrix effect

Future work will focus on molten slag analysis



For both CuO and FeO the correlation between concentration and LIBS signal is significantly improved ($R^2 = 0.988$ and $R^2 = 0.998$ respectively)

MULTIVARIATE CALIBRATION

Partial Least Squares