



FiberLab®

Online bath analysis in cryolite

FiberLab® has been developed for direct and accurate bath chemistry measurement in reduction cells for the primary aluminium industry. The speed, precision and accuracy go beyond the thermocouple technology.

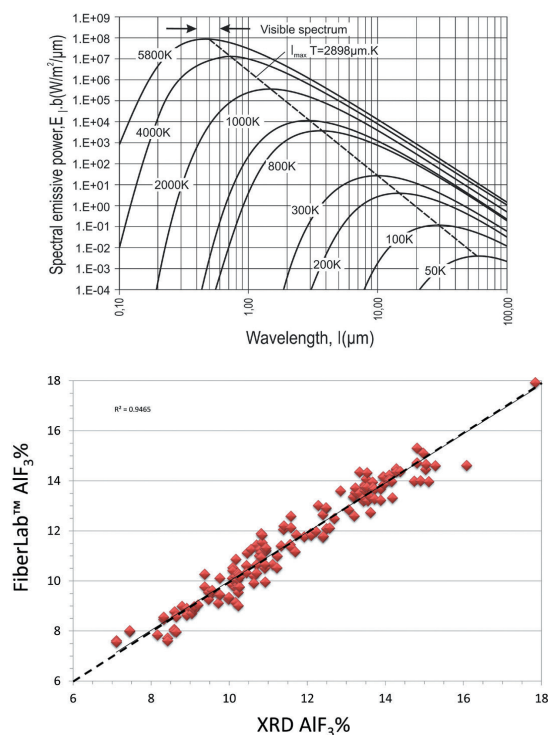
FiberLab® is our extended fiber-optic technology for online bath temperature, Liquidus temperature, superheat and bath chemistry measurements in a single comprehensive measurement system.

Major customer benefits include:

- Bath temperature within 7 seconds
- Superheat within 40 seconds
- Bath chemistry within 2 minutes
- Bath temperature precision +/- 1 degree C

Fiberlab® Measurement Principle

The intensity of light travelling through an optical fiber from a light source such as a molten bath is filtered over a specific wavelength and converted to a temperature value (assuming black body conditions) according to Planck's Law as shown in the graph.



Fiberlab® Operation

A measurement is started by plugging a FiberCup® sensor onto the lance. Once dipped into the cryolite bath, the fiber detects heat and 5cm fiber is fed automatically to the thermal centre of the FiberCup®. After 20 seconds the bath temperature plateau is detected and signalled by the instrument. The lance is removed from the bath together with a small sample of cryolite bath which begins to cool. The lance is carefully placed in a horizontal position and the sample is left to cool through the cryolite solid phases.

After approximately 2.5 minutes the measurement ends and bath temperature, liquidus temperature, superheat, %AlF₃ and calculated/estimated Al₂O₃ concentration are displayed on the instrument.

At the end of the measurement the FiberCup® is removed and the used fiber is manually broken off at the probe holder tip. Assuming a good correlation with the XRD lab, an accuracy within $\pm 1\%$ can be expected with standard deviation 0.5%.



FiberLab® Instrument

- Unique three-mode operation
 - CHEMISTRY for bath temperature, %AlF₃, liquidus, superheat, Al₂O₃ estimation
 - SUPERHEAT for rapid bath temperature, liquidus and superheat
 - TEMPERATURE for fast bath temperature (FiberLance®)
- Robust, industrial housing designed to operate in strong magnetic environments, suitable for portable use on a trolley or electric car
- LCD screen to display bath temperature, liquidus, results of the chemical analysis, pot number and operational information
- Automatic wire feed mechanism
- 'Count-down' indicator of how many measurements remaining on the FiberCartridge®
- Data downloading via USB output to a memory stick or via WiFi using Windows
- 24VDC battery housed within the FiberLab® box – low battery charge indication included
- Robust lance and carrier cable included
- Quick release probe holder for chemistry and superheat mode plus separate lance for temperature only measurements
- Trolley available as an optional extra



FiberLab® Instrument

FiberCup®

The FiberCup® sensor is used for liquidus measurements and chemical analysis. The sensor is design to guide the optical fiber into the thermal centre of the cup and retain a sample of cryolite in order to analyse the chemistry of the bath.



FiberCup®

FiberCartridge®

The consumable fiber is supplied in 100m lengths on a plastic drum, the FiberCartridge® is easy to fit and completely disposable after use.

Measurement Accuracy and Reproducibility

Each FiberCartridge® is pre-calibrated against ITS90 thermocouple calibration at $\pm 0.5^{\circ}\text{C}$ at 980°C and is supplied with a calibration certificate. Providing there is no interruption by Al₂O₃ feeding, an accuracy and reproducibility of $\pm 1^{\circ}\text{C}$ can be expected on the bath temperature.



FiberCartridge®



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