Determination of Sulfur in Ore Concentrate

LECO Corporation; Saint Joseph, Michigan USA

Instrument: CS844, S844

Introduction

The following application note outlines the setting and steps required to determine the sulfur level in ore concentrates with the CS/S844. The sulfur level of the concentrate can be used as a quality control measure to determine the efficiency of the concentration process and provide an estimate of the metal-in-concentrate. With its wide sulfur detection range and easy-to-use touch-screen interface, the CS/S844 sulfur by combustion analyzer makes the perfect addition to any mining operations laboratory.

Sample Preparation

Samples should be crushed to a uniform powder prior to analysis.

Accessories

528-018 or 528-018HP Crucible; LECOCEL II (502-173 or 501-008); 502-231 Iron Chip or 501-077 Accelerator; 773-579 Metal Scoop; 761-929 Tongs

For optimal sulfur precision, ceramic crucibles can be pre-baked in a muffle oven at ≥1000°C for a minimum of 1 hour, or tube furnace (LECO TF1/TF-10) at ≥1250°C for a minimum of 15 minutes. The crucibles are removed from the tube furnace/muffle oven, allowed to cool, and are then transferred to a desiccator for storage. Baked crucibles must be handled with clean tongs only to avoid contamination.

Calibration

502-085 Zinc Sulfide Reference Material or other suitable ore concentrate reference materials.

Method Parameters

General Parameters

Purge Time:	10 s
Delay Time:	20 s
Sample Cool Time:	0 s
Furnace Mode:	Constant
Furnace Power:	100%

Element Parameters	*Sulfur*
Integration Delay:	0 s
Starting Baseline:	2 s
Use Comparator:	No
Integration Time:	55 s
Use Endline:	Yes
Ending Baseline:	2 s
Range Select:	Auto
Range Lower Limit:	800
Range Upper Limit:	950

Procedure

1. Prepare instrument for operation as outlined in the operator's instruction manual.
2. Determine the instrument Blank.
   a. Login a minimum of three Blank reps.
   b. Add one 773-579 Scoop (~1.2 g) of LECOCEL II and one 773-579 Scoop (~0.8 g) Iron Chip.
   c. Place the crucible on the furnace pedestal (or appropriate autoloader position if applicable), and initiate analysis.
   d. Repeat steps 2b through 2c a minimum of three times.
   e. Set the blank by following the procedure outlined in the operator's instruction manual.
3. Calibrate/Drift Correct
   a. Login a minimum of three standard/drift reps.
   b. Weigh ~0.15 g of 502-085 Zinc Sulfide reference material or other suitable calibration/drift material into the crucible and enter the mass and identification of the reference material.

      Note: Alternate calibration use ~0.05 to ~0.20 g for multi mass calibration linear (three reference material reps @ each mass).

   c. Add one 773-579 Scoop (~1.2 g) of LECOCEL II and one 773-579 Scoop (~0.8 g) Iron Chip.
   d. Place the crucible on the furnace pedestal (or appropriate autoloader position if applicable) and initiate analysis.
   e. Repeat steps 3b through 3d a minimum of three times for each calibration/drift reference material intended for calibration/drift.
   f. Calibrate/drift correct by following the procedure outlined in the operator's instruction manual.
4. Sample Analysis
   a. Login a sample with appropriate number of reps.
   b. Weigh ~0.05 to 0.20 g of ore concentrate sample into the crucible and enter the mass and identification.

      Note: Maximum instrument range is 60 mg sulfur.

   c. Add one 773-579 Scoop (~1.2 g) of LECOCEL II and one 773-579 Scoop (~0.8 g) Iron Chip.
   d. Place the crucible on the furnace pedestal (or appropriate autoloader position if applicable), and initiate analysis.

Inorganic Application Note

Delivering the Right Results

Typical Results

Sample	*Mass (g)*	*% Sulfur*
502-085	0.0508	32.62
Zinc Sulfide	0.0498	32.99
32.91% Sulfur	0.0503	32.98
	0.1012	33.12
	0.1024	32.95
	0.1000	33.02
	0.1513	32.79
	0.1493	33.01
	0.1520	32.84
	0.2001	33.60
	0.2006	33.28
	0.2020	33.61
	Avg =	***33.07***
	s =	***0.30***
CCU-1c	0.0515	33.56
Copper Concentrate	0.0523	33.59
33.3% Sulfur	0.0490	33.32
	0.1025	33.71
	0.0997	33.58
	0.1000	33.29
	0.1506	33.63
	0.1496	33.34
	0.1511	33.23
	0.2011	33.32
	0.1998	33.25
	0.2003	33.40
	Avg =	***33.44***
	s =	***0.17***

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