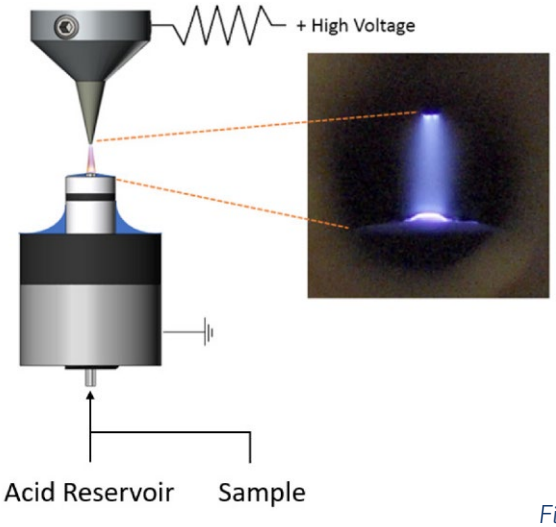
InnoTech ALBERTA
A SUBSIDIARY OF ALBERTA INNOVATES

INDUSTRIAL SENSOR TECHNOLOGIES & INFORMATICS

Solution Cathode Glow Discharge

ONLINE ELEMENTAL ANALYSIS

The solution cathode glow discharge (SCGD) analyzer is a novel piece of instrumentation for automated, online elemental analysis.



- Low Power, 65 Watts
- Passive Cooling
- No Plasma Gas Consumption
- Simplicity
- No Short Term Drift
- Low Cost
- Contained Exhaust Gases
- Ceramic wick interface allows low flow rate for optimised emission intensity/stability
- Purged atmospheric gases

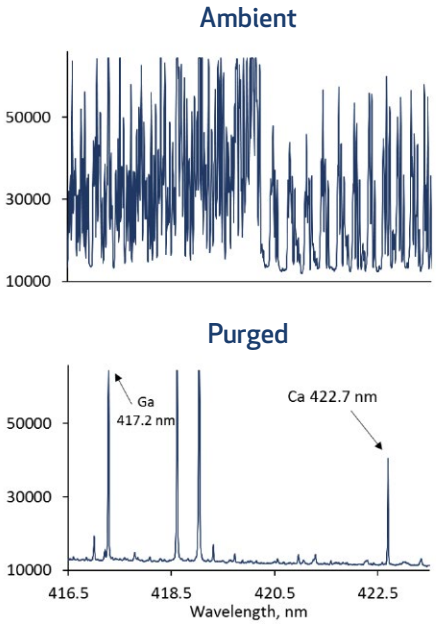


Figure 1 – InnoTech Innovations for SCGD

The SCGD technology works by interpreting spectra in the ultraviolet-visible (UV-VIS) region using atomic emission spectroscopy (AES). This is accomplished by generating a plasma at near atmospheric pressure between a cathode and anode and monitoring the light emitted. High voltage direct current is supplied to the anode. The water sample to be measured is acidified with 0.111M HNO_3(aq) and continuously flows over a grounding electrode, which provides the return path for the electrical circuit. Therefore, the flowing, acidified sample acts as the cathode of the circuit and a sputtering action ejects material into the plasma. Once in the plasma, high energy electrons excite elemental emission at characteristic wavelengths. This emitted light is measured and analyzed to provide the elemental concentration in the original water sample.

InnoTech Alberta holds two patents related to this technology, with substantial innovations that have enabled the use of this technique for online elemental analysis. Figure 1 and Figure 2 show the InnoTech Alberta advantage.

Detection Limit Comparison, ppb

Element	ICP-AES[1]	Previous Best SCGD	InnoTech Alberta - SCGD
Ni	4	5	0.6
Co	2	9	2
Zn	1	8	0.5
Ca	0.1	8	0.4
Mg	0.3	0.2	0.02
In	100	2	0.08
Ga	-	-	0.2
Tl	15	1	0.08
Al	5	300	7
Na	2	0.04	0.003

[1]Inductively Coupled Plasma Spectrometry and its Applications, Steve J. Hill, 2007.

Figure 2 – InnoTech SCGD Detection Limits Example

Water Hardness for Boiler Fouling

The SCGD can quantify both calcium and magnesium concentrations between 0.020-2 ppm and 0.012-1.2 ppm, respectively, for samples with water hardness of 0.1-5.0 ppm (as $CaCO_3$).

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Figure 3. SCGD System Layout

PRODUCT DESCRIPTION

The SCGD has four main components (Figure 3): 1) a programmable logic controller (PLC) system; 2) sample conditioning system; 3) plasma and optical system; and 4) waste management system.

The PLC controls the entire system, from moving samples from the conditioning system to the plasma generator for analysis, to asking for spectra interpretation, to providing the analyzed results to the client. With a user-friendly interface, the system can be controlled via an industrial human machine interface (HMI).

SPECIFICATIONS

System Inputs

- 120 Volt, 20A, Single Phase AC power.
- Sample line design pressure and temperature of 1379 kPa(g) and 150°C.
- 0.111M HNO_3(aq) matrix solution pre-mixed and supplied from 95L container.
- Instrument air.

System Outputs

- Modbus TCP.
- 4x Analog 4-20mA.

Equipment Details

- General zone classification.
- NEMA 4X ingress protection.
- CSA inspected.
- Operating Temperature – +5 to + 28 C
- Relative Humidity – 20 to 85% non-condensing

InnoTech Alberta, a subsidiary of Alberta Innovates, is a leading research and technology organization serving the needs of industry, entrepreneurs and the public sector. Our leading-edge expertise and industrial-scale research and demonstration facilities accelerate and de-risk technology development and deployment for our clients with a focus on industrial solutions and commercial applications.

Visit us at: InnoTechAlberta.ca

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