



Technology Readiness Level: **4**
 Component and/or Breadboard Validation
 in Laboratory Environment

In-Field Hexavalent Chromium Water Analysis

The Problem

Hexavalent chromium, Cr(VI), is a U.S. Environmental Protection Agency (EPA) Priority Pollutant. The toxicity, mobility, and widespread occurrence of Cr(VI) groundwater contamination make less costly, reliable detection and quantification of this species a high priority for environmental monitoring. Cr(VI) has been shown in laboratory testing, to have strong evidence of being carcinogenic when ingested in drinking water. Cr(VI) typically exists in groundwater as the highly soluble and mobile chromate anion.



Benefits

- Provides detection of Cr(VI) levels well below acceptable standard
- Rapid results in the field
- Affordable
- Outperforms other sensor designs
- Helps reduce costs associated with regulatory compliance

The Solution

Eltron has developed a portable system for rapid, sensitive monitoring of hexavalent chromium in water. The system is built around a proprietary, microfabricated electrochemical sensor that detects Cr(VI) with a sensitivity 190 times higher than that for the trivalent form. As a result, Cr(VI) can be monitored independently of other chromium species. This technique provides detection of Cr(VI) well below the acceptable level of 100 ppb MCL set by EPA. It can be applied to natural water, drinking water, wastewater or remediation process streams.

Testing samples is quite simple. Users specify test parameters through the interface on the front of the instrument. A miniature peristaltic pump draws the sample through an ionexchange column where Cr(VI) is preconcentrated. The Cr(VI) is then eluted from the column, mixed with a reagent solution, and drawn through a small volume flow cell where Cr(VI) is selectively analyzed. Analysis data is processed in a software application developed using National Instruments' LabVIEW™ and results are displayed on the user interface.

Features and Benefits

Eltron's monitor provides sensitive, selective detection of contaminants in a portable, affordable package. Applications include monitoring leakage from storage areas, plume movement in groundwater, continuous monitoring at critical compliance points and evaluation of residual contamination after remediation.

While reduction of Cr(VI) at solid electrodes is usually hampered by slow kinetics, Eltron's proprietary electrode provides rapid reduction of Cr(VI). The sensor can detect concentrations of Cr(VI) as small as 10 ppb, with a linear dynamic range to 1000 ppb. The signal/noise ratio for Cr(VI) response varies less than 10% for a given electrode over 30 days of use. Humic acid, a ubiquitous background component found in natural water samples, does not interfere with the analytical performance – a problem common to optical sensors.

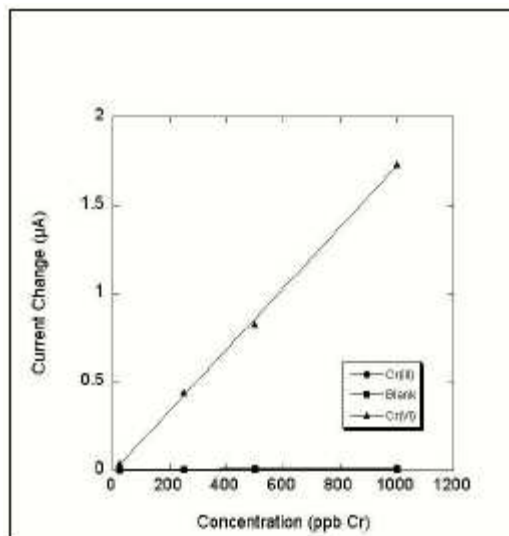
The EPA standard methods for Cr(VI) quantification in water samples are atomic absorption (AA) spectrometry and inductively coupled plasma-atomic emission spectrometry (ICP-AES). These methods are sensitive, with detection limits of ca. 1 ppb, but are laboratory-based techniques that require large, expensive equipment. Plus, sending samples to a lab for testing could mean that it will be days or weeks before the results are available.

Built for field use, Eltron's Cr(VI) monitor rapidly returns analysis results, reducing the cost and effort associated with routine environmental testing and sample screening essential to ensuring safe working and living conditions. The monitor is simple to operate and maintain. It runs on batteries and the electrode chips central to sample analysis can be replaced at low cost.

Stage of Development

Eltron has developed a portable field deployable prototype.

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Eltron's monitor is responsive only to Cr(VI). Note that Cr(III) gives a signal indistinguishable from background.

Contact Us

To discuss the possibility of entering into a business relationship with Eltron, contact the Business Development Group at business@eltronresearch.com.

To learn more about Eltron Research & Development and the many technologies that the company is researching and commercializing, visit www.eltronresearch.com.



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