

A Green Fieldable Analyzer for Arsenic

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Dermal, neurological and carcinogenic effects have been reported for arsenic (As) that occur widely in nature, the 20th most abundant element, and has generated much concern. Toxic levels have been documented in over 26 countries while assessments in the US show that 32 million people live in areas where arsenic concentration ranges from 2 to 50 $\mu\text{g}/\text{L}$. Arsenic concentration in water systems varies temporally, according to water usage and precipitation. Routine monitoring is essential for measuring efficacy of remediation and to ensure accuracy of exposure estimates. Measurement methods in the developed world have relied on atomic spectroscopic methods. This is expensive in both instrumentation and supplies and is not portable. The field techniques used in the developing world require the use of large amounts of acid reagents and paper strips impregnated with toxic mercury and lead compounds.

We present a fast, safe, lower cost arsenic analyzer which can be used in the field or laboratory for batch or continuous determination of waterborne As. Detection is based on chemiluminescence in which, ozone reacts with electrochemically generated arsine. Differential determination of As (III) and As (V) can be carried out based on the dependence of arsine generation on cathode material.

Except for dilute sulfuric acid that is used as the electrolyte and is not consumed, the system uses only air water and electricity ($\sim 50\text{ W}$) to make the determination with sub- $\mu\text{g}/\text{L}$ detection limits, competitive with lab-based atomic spectrometry and much lower than the EPA prescribed safe limit of $10\ \mu\text{g}/\text{L}$.

