ELECTRIFIED FILTERS FOR HEXAVALENT CHROMIUM REMOVAL

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CONTACT

Sabrina N. David
sabrina.david@berkeley.edu
tel: .

INVENTORS

» Sedlak, David L.

OTHER INFORMATION

CATEGORIZED AS

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PATENT STATUS

Patent Pending

BRIEF DESCRIPTION

While chromium (Cr) is recognized as an essential micronutrient, its hexavalent form, Cr(VI), is one of the ubiquitous metal contaminants prevalent in groundwater with toxicity and carcinogenic risks. After years of debate and analysis, California regulators adopted a limit of 10 ppb for Cr(VI) in drinking water in April 2024, which should lead to more stringent regulation of Cr(VI) nationwide and attract up to hundreds of millions of dollars in investment. Electroreduction of Cr(VI) to Cr(III) is a promising strategy for detoxication of Cr(VI), but the noble-metal-based and nanomaterial-based electrodes typically used for Cr(VI) reduction are expensive or require a complicated preparation process. Moreover, the majority of flat-sheet electrodes used in flow-by operation mode are constrained by surface area, which causes low mass transport, detoxication efficiency, and current efficiency, and generates high energy consumption.

To meet these challenges, UC Berkeley researchers have developed a stainless-steel filter with the capability of selectively reducing Cr(VI) to Cr(III) in-situ during a single pass filtration process. The filter doesn't require chemical inputs or generate waste sludge. It has demonstrated minimal electric energy consumption while removing Cr(VI) from real groundwater samples (Coachella Valley Water District, California, calculated at 0.00076 $\$/m^3$ –beating other techniques by several orders of magnitude). The water flux of the filter is adjustable to meet specific, realistic water treatment requirements, and it can furthermore be regenerated in-situ for long-term performance without off-site chemical-dependent cleaning procedures. This environmentally friendly filter efficiently removes Cr(VI) from traditional and non-traditional water sources using minimal energy input and with zero discharge, addressing critical issues in water scarcity and Cr(VI) contamination.

SUGGESTED USES

- Chromium removal from groundwater
- Oxyanion removal from industrial wastewater
- Expanding water supply from non-traditional water sources
- Point of use and point of entry household water treatment systems

ADVANTAGES

- Minimal energy input and zero-discharge filtration system
- Variety of shapes and sizes meeting performance needs of realistic water treatment applications
- Compatible with electrified membrane filtration settings and under electrified modular cartridges

RELATED MATERIALS

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University of California, Berkeley Office of Technology Licensing
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