

Electrically Charged Column for Nanoplastic, Heavy Metals, PPCPs and PFAS Removal

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Abstract

USU researcher Dr. Yiming Su has developed a water treatment system targeting pollutants such as PFAS, PPCPs, nanoplastics, and heavy metals. Water is treated as it passes through a cylindrical filter across which an electric potential is applied. Materials serving as anodes, cathodes, and electrodes are specifically designed to target pollutants of interest.

Problem

Emerging pollutants like PPCPs, heavy metals, and PFAS threaten water security by contaminating groundwater, impacting drinking and irrigation water. Current treatment methods can be costly or ineffective.

Solution

This filtration system treats and purifies water by applying voltage to the filter components to remove PPCPs, PFAS, heavy metals, and nano-plastics. It can be cleaned for reuse and adjusted to enhance oxidation to degrade contaminants.

Value Proposition

As water demand and pollution rise, this affordable, efficient, and eco-friendly technology meets the need for clean water. Its easy-to-clean, adjustable design ensures reliable treatment across many cycles.

Benefit

Emerging pollutants, including pharmaceuticals and personal care products (PPCPs), heavy metals, and polyfluorinated substances (PFAS), are posing a great risk to water security. Groundwater is often contaminated, posing a threat to both drinking water sources and agricultural irrigation water. Current water treatment technologies can be ineffective or costly.

The Electrically Charged Column provides a robust water filtration and treatment system that can be used for groundwater treatment of irrigation systems and underground water storage supplies, as well as for electrochemical water purification for surface water such as reservoirs, lakes, and rivers. This technology has been demonstrated to successfully remove PPCPs, PFAS, heavy metals, and nano-plastics from water by applying a voltage to components within the filter. Furthermore, the system can be easily cleaned to ensure reliable use over time. Adjustments can be made to enhance oxidation to degrade pesticides and PPCPs.

As demand for clean water sources grows with population increases and the spread of harmful pollutants, this technology offers an inexpensive solution for water treatment. This technology meets the growing demand for water treatment solutions that are efficient and environmentally responsible. The design of this technology allows it to be easily cleaned, so it can reliably treat water for many cycles. Further, this technology has a variable design that can be adjusted to target specific pollutants as needed.

Market Application

In a consumer setting, this technology could be used for individual household water treatment services. This technology would also be beneficial in a municipal setting, where government entities would use it to treat water for an entire city or region. Further, this technology could be utilized by industrial operators to clean water as it exits their facilities.

Inventors

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Intellectual Property

Pending Non-Provisional Patent Application filed July 2025.