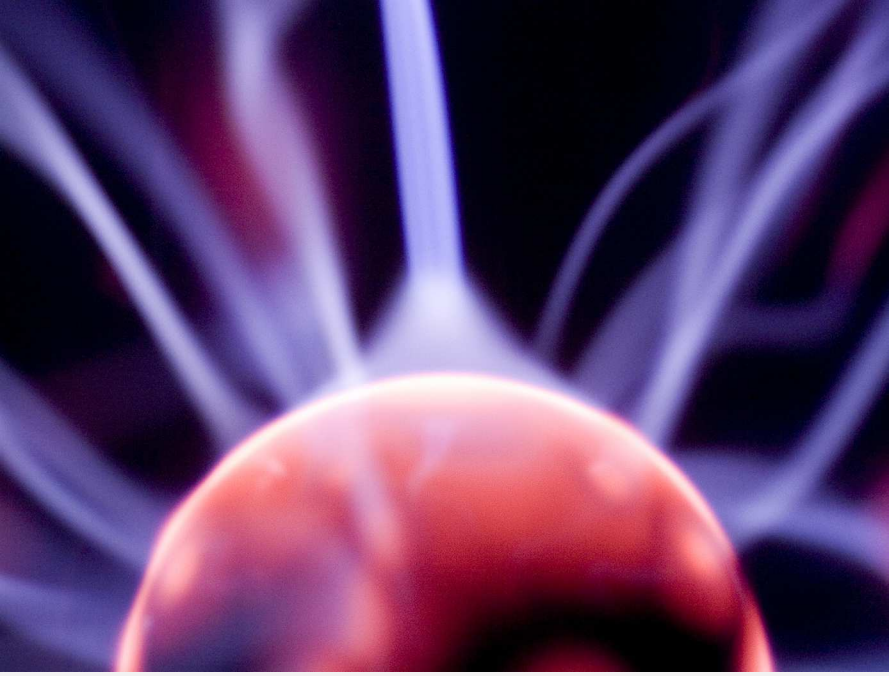

National Aeronautics and Space Administration

technology solution

Environment

High-Voltage Water Purification

For Water Recycling or Point-of-Use Applications

Scientists at NASAs Glenn Research Center have developed a unique water purification method that can be used for water recycling or point-of-use applications. Originally developed as a means to recycle water in space, this technology has applications in industrial water treatment, water recycling, and water purification for military bases, disaster sites, and regions without easy access to clean water. Relying on only electrical energy, this technology uses plasma-generated reactive species to decompose organic contaminants, ranging from submicron particles to water soluble organics like glycol, ethanol, and industrial dyes.

BENEFITS

- Environmentally friendly: Does not introduce toxic chemicals into liquids
- Readily available: Provides clean water on-demand
- Accessible: Accommodates large-volume, high-throughput applications and works with in-volume and in-line water feed systems
- Simple: Operates without filters, which can often become fouled or punctured
- Durable: Housed in a self-contained unit
- Highly antiseptic: Attacks and destroys microbes

THE TECHNOLOGY

Highly oxidizing water treatments, like ozonation and UV-ionization, have proven useful in removing organics from water, but they require high capital costs and high amounts of wasteful energy consumption. Glenn's approach to water purification uses high-voltage, nanosecond-pulsed, non-equilibrium plasma to treat water. The pulsed electrical discharge destroys micro-organisms in liquid, essentially sterilizing the water, without the use of toxic chemicals or filters. The plasma creates highly reactive OH radicals (e.g. hydroperoxl, hydrogen peroxide, super oxide O2) that break down organic contaminants into carbon dioxide and water. The nano-pulses ensure that only enough energy is produced to destroy the contaminant without heating up the water, eliminating the need for cooling loops or downtime that is associated with other processes (such as UV-ionization). NASAs water purification technology relies only on electricity and can be scaled to meet a wide range of needs, from small portable units that purify drinking water in disaster relief to million-gallons-per-day industrial applications. This technology is simple, straightforward, and low cost, with virtually no consumables nor byproducts. Furthermore, the plasma pulse technology can function as a stand-alone purification process or as an add-on to existing solutions as a polishing step.

The Glenn water purification system has application in wastewater treatment

The Glenn water purification system provides clean water on demand

APPLICATIONS

The technology has several potential applications:

- Wastewater treatment
- Pharmaceutical and food and beverage water treatment
- Pretreatment of contaminants
- Point-of-use drinking water
- Groundwater treatment
- EPA Superfund site cleanup
- Hydraulic fracturing water reuse

PUBLICATIONS

Patent Pending

More Information

National Aeronautics and Space Administration

Technology Transfer Office

Glenn Research Center

21000 Brookpark Road
Cleveland, OH 44135
216-433-3483
ttp@grc.nasa.gov

http://technology.nasa.gov/

www.nasa.gov

NP-2015-04-1498-HQ

NASA's Technology Transfer Program pursues the widest possible applications of agency technology to benefit US citizens. Through partnerships and licensing agreements with industry, the program ensures that NASA's investments in pioneering research find secondary uses that benefit the economy, create jobs, and improve quality of life.

LEW-18732-1