



technology opportunity

Contaminated Water Treatment

Methods for Recycling a Contaminant Liquid to Provide Re-drinkable Water



The system for purification contains a contaminant treatment pouch that converts urine or another liquid into a fortified drink, engineered to meet human hydration, electrolyte, and caloric requirements.

Scientists at NASA Ames have developed a method and system for processing a liquid (contaminant liquid) containing water and containing urine and/or other contaminants in a two step process. Urine, or a contaminated liquid similar to and/or containing urine and thus having a relatively high salt and urea content, is passed through an activated carbon filter to provide a resulting liquid to remove most of the organic molecules. The resulting liquid is passed through a semi-permeable membrane from a membrane first side to a membrane second side, where a fortified drink having a lower water concentration (higher osmotic potential) than the resulting liquid is positioned. Osmotic pressure differential causes the water, but not most of the remaining inorganic (salts) contaminant(s) to pass through the membrane to the fortified drink. Optionally, the resulting liquid is allowed to precipitate additional organic molecules before passage through the membrane.

Benefits

- Provides renewable source of drinking water
- Reduces the mass of water initially stored above a vessel
- Provides temporary source of additional nutrients for passengers
- Eliminates the need for urine disposal system during voyage

Technology in Detail

A concept originally developed for the Crew Exploration Vehicle (CEV) and the Lunar Surface Access Module (LSAM), the contaminated water treatment system was designed to reduce the mass required to keep humans alive in space. As water accounts for about 80% of the daily mass intake required to keep a person alive, having a water recycling system provides an emergency supply of drinking water that not only has the potential to save lives, but also can reduce the mass required to be transported to provide drinking water by 65%, when compared to stored water. This technology also provides an alternative water source by providing a lightweight back-up to stored supplies because of its ability to recycle the water contained in urine. The system, which eliminates the need to have a dedicated vent to dump urine overboard, converts urine into a concentrated brine that is biologically stable and non-threatening and can be stored safely aboard any vessel.

A treatment pouch, referred to as a “urine cell” or “contaminant cell,” converts urine or another liquid containing contaminants into a fortified drink. The initial process starts with a variant of forward osmosis that draws water from a urine container, which is then followed by an activated carbon pre-treatment that removes most organic molecules. Salinity of the initial liquid mix (urine plus other) is synergistically used to enhance the precipitation organic molecules so that activated carbon can remove most of the organics. A functional osmotic bag is then used to remove inorganic contaminants. If a contaminant is processed for which the saline content is different than optimal for precipitating organic molecules, the saline content of the liquid should be adjusted toward the optimal value for that contaminant.

Patents

This technology has been patented (U.S. Patent 7,655,145).

Licensing and Partnering Opportunities

This technology is part of NASA’s Innovative Partnerships Program, which seeks to transfer technology into and out of NASA to benefit the space program and U.S. industry. NASA invites companies to inquire about licensing possibilities for this technology for commercial applications.

For More Information

If you would like more information about this technology, please contact:

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