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Moon Ice Neg 1

1NC Desalinization CP 2

1NC Solvency Frontline 4

2NC Desalinization Solves 5

1NC Desalinization CP

The United States Federal Government should fund the development and distribution of worldwide desalinization and filtering.

Desalinization produces fresh water and it’s easy to filter out impurities

David L. Chandler, MIT News Office March 23, 2010: A system that’s worth its salt

Potable water is often in high demand and short supply following a natural disaster like the Haiti earthquake or Hurricane Katrina. In both of those instances, the disaster zones were near the sea, but converting salty seawater to potable fresh water usually requires a large amount of dependable electrical power and large-scale desalination plants — neither of which were available in the disaster areas. A new approach to desalination being developed by researchers at MIT and in Korea could lead to small, portable units that could be powered by solar cells or batteries and could deliver enough fresh water to supply the needs of a family or small village. As an added bonus, the system would also remove many contaminants, viruses and bacteria at the same time. The new approach, called ion concentration polarization, is described in a paper by Postdoctoral Associate Sung Jae Kim and Associate Professor Jongyoon Han, both in MIT’s Department of Electrical Engineering and Computer Science, and colleagues in Korea. The paper was published on March 21 in the journal Nature Nanotechnology. One of the leading desalination methods, called reverse osmosis, uses membranes that filter out the salt, but these require strong pumps to maintain the high pressure needed to push the water through the membrane, and are subject to fouling and blockage of the pores in the membrane by salt and contaminants. The new system separates salts and microbes from the water by electrostatically repelling them away from the ion-selective membrane in the system — so the flowing water never needs to pass through a membrane. That should eliminate the need for high pressure and the problems of fouling, the researchers say. The system works at a microscopic scale, using fabrication methods developed for microfluidics devices — similar to the manufacture of microchips, but using materials such as silicone (synthetic rubber). Each individual device would only process minute amounts of water, but a large number of them — the researchers envision an array with 1,600 units fabricated on an 8-inch-diameter wafer — could produce about 15 liters of water per hour, enough to provide drinking water for several people. The whole unit could be self-contained and driven by gravity — salt water would be poured in at the top, and fresh water and concentrated brine collected from two outlets at the bottom. That small size could actually be an advantage for some applications, Kim explains. For example, in an emergency situation like Haiti’s earthquake aftermath, the delivery infrastructure to get fresh water to the people who need it was largely lacking, so small, portable units that individuals could carry would have been especially useful. So far, the researchers have successfully tested a single unit, using seawater they collected from a Massachusetts beach. The water was then deliberately contaminated with small plastic particles, protein and human blood. The unit removed more than 99 percent of the salt and other contaminants. “We clearly demonstrated that we can do it at the unit chip level,” says Kim. The work was primarily funded by a grant from the National Science Foundation, as well as a SMART Innovation Centre grant. While the amount of electricity required by this method is actually slightly more than for present large-scale methods such as reverse osmosis, there is no other method that can produce small-scale desalination with anywhere near this level of efficiency, the researchers say. If properly engineered, the proposed system would only use about as much power as a conventional lightbulb. Mark A. Shannon of the Center of Advanced Materials for the Purification of Water with Systems at the University of Illinois at Urbana-Champaign, who was not involved in this work, agrees with that assessment. In a News & Views piece that accompanies the Nature Nanotechnology paper, he writes that the new system achieves “perhaps the lowest energy ever for desalinating microliters of water,” and when many of these micro-units are combined in parallel, as Kim and his co-authors propose, “it could be used to supply liters of water per hour using only a battery and gravity flow of water.” That meets a significant need, he says, since at present there are few efficient methods for small-scale desalination, both for emergencies and for use in remote areas in poor countries. Alex Iles, a research scientist at the University of Hull in Britain, says that while further testing must be done to establish long-term stability and fabrication techniques, “This is an elegant new concept for water desalination.” He says it is likely to produce a low-cost, low-maintenance system that could be “ideal for applications such as disaster relief.” When it was initially presented at a conference he attended last year, Iles says, “I thought it was probably the most significant new work at the entire conference, even though it was only a poster.” The basic principle that makes the system possible, called ion concentration polarization, is a ubiquitous phenomenon that occurs near ion-selective materials (such as Nafion, often used in fuel cells) or electrodes, and this team and other researchers have been applying the phenomenon for other applications such as biomolecule preconcentration. This application to water purification has not been attempted before, however. Since the separation occurs electrostatically, it doesn’t work for removing contaminants that have no electric charge. To take care of these remaining particles — mostly industrial pollutants — the researchers suggest the unit could be combined with a conventional charcoal filter system, thus achieving pure, safe drinking water through a single simple device. Having proved the principle in a single-unit device, Kim and Han plan to produce a 100-unit device to demonstrate the scaling-up of the process, followed by a 10,000-unit system. They expect it will take about two years before the system will be ready to develop as a product. “After that,” says Kim, “we’ll know if it’s possible” for this to work as a robust, portable system, “and what problems might need to be worked on.”

1NC Solvency Frontline

There is little to no water on the moon, making it pointless to mine

Anne **Minard**, Staff Writer, February 12, 20**09** New high-res map suggests little water inside moon Universetoday.com

“The surface can tell us a lot about what’s happening inside the Moon, but until now mapping has been very limited,” said C.K. Shum, professor of earth sciences at Ohio State University, and a study co-author. ”For instance, with this new high-resolution map, we can confirm that there is very little water on the Moon today, even deep in the interior. And we can use that information to think about water on other planets, including Mars.” But the team did something more with the map: they measured the roughness of the lunar surface, and used that information to calculate the stiffness of the crust. If water flowed beneath the lunar surface, the crust would be somewhat flexible, but it isn’t, the authors say. They add that the surface is too rigid to allow for any liquid water, even deep within the Moon. Earth’s surface is more flexible, by contrast, with the surface rising or falling as water flows above or below ground. Even Earth’s plate tectonics is due in part to water lubricating the crust.

There are several simple alternatives to finding water than moon mining

Anne **Lummerich** Writer 20**10** National Geographic, Alternatives to water

There may be plenty of water on our blue planet, but the vast majority (almost 98%) is unfit for human use. Today, an estimated three hundred million people now meet their water needs with water that is too salty to drink. And the situation isn't getting any better. Climate change and population growth are causing precious freshwater resources to evaporate before our very eyes. Enter desalination. The process of removing salt from sea or brackish groundwater took off in the oil-rich Middle East in the 1970s and has since spread to 150 countries. The problem? Besides the harmful concentrated brine left behind by the process, desalination is hugely expensive and energy-intensive. But new technologies are helping the cause. National Geographic reports on three new technologies that promise to reduce the energy (and cost) requirements of removing salt from water, while warning that none are simple and cheap enough to offer much hope to the world’s poor,

2NC Desalinization Solves

We need desalination

Isabel **Allende**, Author, Rebecca **Maxon,** Associate Director of Communications and Publications, Office of Communications and Marketing. 20**03** Is Desalination the Answer?fdu.edu

Chilean novelist Isabel Allende sums it up concisely in *Water: The Drop of Life,* by Peter Swanson and Mikhail Gorbachev, when she says, “We need a global approach to this from all sides. We need to educate people, we need the scientists to create new technologies, we need the engineers to create the networks, we need every human being to be aware of how precious water is and save it.” In Harvey Winters and his desalination research we find the global outlook, educational experience and the scientific expertise required to take on this challenge and desalinize.