Neues Denken. Neue Materialien.

Third generation electrochemical water desalination: Saarbrücken researchers present novel method

Saarbrücken, April 14, 2020

Joint press release of INM – Leibniz Institute for New Materials and Saarland University


INM scientists Prof. Dr. Volker Presser (left) and Dr. Pattarachai Srimuk (right)
Source: Uwe Bellhäuser
Photos in higher resolution can be found here.

Volker Presser, head of the program division Energy Materials at INM - Leibniz Institute for New Materials in Saarbrücken and professor for Energy Materials at Saarland University, has achieved a breakthrough in the field of electrochemical water desalination with his research group. In the current issue of the journal Electrochemistry Communications, he and his co-authors present the novel method of zinc-air desalination (ZAD), which removes much larger amounts of salt from the water compared to previous processes.

Salt is not only a component of seawater, but it is also found, for example, in industrial wastewater, which in many cases is discharged into rivers. This increases the salt content of the rivers themselves, but lakes and not least the groundwater are also affected. Electrochemical processes have proven to be effective in removing salts from this so-called brackish water. These processes do not require the addition of any chemicals at all. In addition, they are extremely energy-efficient - in contrast to the widespread reverse osmosis process, in which salt and water are separated by forcing the water to be purified through a membrane with a high energy input.

The electrochemical process of the first generation, water treatment through ion electrosorption (Capacitive Deionisation, CDI) has been known since 1960. Here, electrodes made of activated carbon are used and the salt yield is about 20 mg per gram of electrode material. The second generation process (Faradaic Deionisation, FDI), which has been

KONTAKT

INM – Leibniz-Institut
für Neue Materialien gGmbH
Campus D2 2
66123 Saarbrücken
www.leibniz-inm.de

Christine Hartmann
Veranstaltungen/Presse
Christine.hartmann@leibniz-inm.de
(Tel: 0681-9300-244)

in use since 2012, uses charge transfer materials similar to those found in batteries. This new method has already made it possible to increase the amount of salts deposited by a factor of ten.

However, the Saarbrücken researchers were not satisfied with the achieved yield: "In order to achieve even higher desalination capacities, it is necessary to use electrochemical processes and materials with a much higher charge storage capacity, since salt removal correlates directly with this property," explains materials scientist Presser. Pattarachai Srimuk, first author of the article and postdoc at the INM, adds: "In our search for a third-generation electrochemical desalination technology, we were inspired by metal-air battery technology and introduced zinc-air desalination. The resulting desalination performance of 1300 mg per gram of electrode material is far superior to all previously reported CDI and FDI processes and opens up completely new ways and possibilities".

The zinc-air desalination method is only one step towards a new family of technologies. The INM innovation can also be extended to other metal-air battery systems. Volker Presser is sure: "Only such new methods will be able to combine energy turnaround and sustainable water use".

Bibliographic information:
P. Srimuk, L. Wang, Ö. Budak, V. Presser, High-performance ion removal via zinc-air desalination, Electrochemistry Communications 115 (2020) 106713
DOI: https://doi.org/10.1016/j.elecom.2020.106713

Your expert at INM:
Prof. Dr. Volker Presser
E-Mail: volker.presser@leibniz-inm.de
For inquiries please contact by mail; Prof. Presser will call back soon.