

# SEMINAR

## aus

# Halbleiterphysik und Nanotechnologie

Di, 1.3.2016, 13:15 Uhr, Hörsaal für Physik

## CAPACITIVE DEIONIZATION

### AN EMERGING WATER TREATMENT TECHNOLOGY

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Capacitive deionization (CDI) is an emerging energy-efficient water desalination technology with high potential for energy-efficient operation. The past decade, and in particular the past three years, has seen the emergence of numerous novel cell architectures, electrode materials, applications, experimental methods, and theoretical advances, completely revolutionizing this field. In CDI, salt ions are removed from aqueous solution upon applying an electrical voltage difference between two porous electrodes, in which the ions will be temporarily immobilized. Once the electrodes are fully saturated, regeneration can easily be accomplished by discharging the electrodes or reversing polarity. CDI electrodes are made of nanoporous carbons and the pore structure heavily impacts on the desalination capacity and removal rate.

In the lecture, the science and technology of CDI will be reviewed and the rational design for carbons with optimized for salt storage capacity and ion and electron transport will be discussed. The most promising recent developments will be outlined, in particular carbon suspension electrodes as a novel (or rather: rediscovered) approach for continuous and efficient CDI operation.

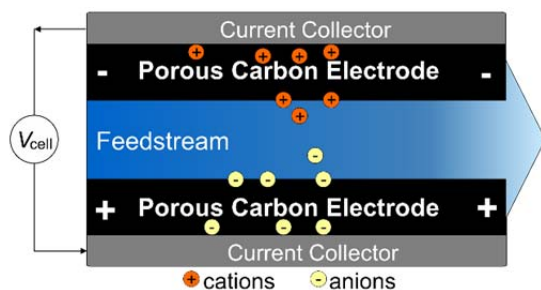


Fig. 1: Concept of ion removal via CDI.

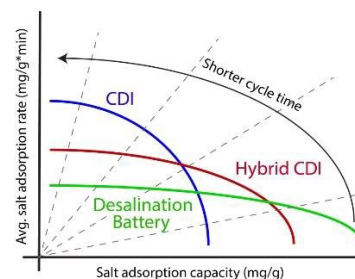


Fig. 2: Performance range for electrochemical water treatment technologies

#### Further reading

- Porada, Borchardt, Bryjak, Atchison, Keesman, Kaskel, Presser. Direct prediction of the desalination performance of porous carbon electrodes for capacitive deionization. *Energy Environ Sci.* 2013;6(12):3700-12.
- Porada, Zhao, van der Wal, Presser, Biesheuvel. Review on the science and technology of water desalination by capacitive deionization. *Progress in Materials Science.* 2013;58(8):1388-442.
- Suss, Porada, Sun, Biesheuvel, Yoon, Presser. Water desalination via capacitive deionization: what is it and what can we expect from it? *Energy Environ Sci.* 2015;8(8):2296-319.