



# MELPRO

membrane and electromembrane processes

NOVEMBER 8–11, 2020  
PRAGUE, CZECH REPUBLIC  
INTERNATIONAL CONFERENCE



## book of abstracts

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# BOOK OF ABSTRACTS



On-line International Conference  
on Membrane Processes

8-11, November 2020

Prague, Czech  
Republic

Organized by CZECH MEMBRANE PLATFORM,

[www.czemp.cz](http://www.czemp.cz)

**Book of Abstracts, MELPRO Conference, 2020**

Edited by Czech Membrane Platform

Published by Czech Membrane Platform in 2020

Printed by Academic and Medical Conference Agency

1<sup>st</sup> edition, 100 copies

Abstracts, except for their headings, are printed without editing.

ISBN 978-80-907673-3-1

ISSN 2694-8958

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**To encourage student participation at the conference and to feature excellent works, the organizers of the MEPRO 2020 conference are pleased to award the best student oral and poster presentations. Student Award ceremony will be the part of the Closing Ceremony.**

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## **PREFACE**

Dear colleagues,

You are opening the Book of abstracts of the Membrane and Electromembrane Processes Conference MELPRO 2020 which is organized by the Czech Membrane Platform in collaboration with AMCA.

The current covid-19 pandemic has significantly affected the organization of the conference MELPRO 2020. The original date of April 2020 had to be canceled due to the pandemic and the new date was set for November 2020. At the same time we started to prepare for the potential online conference but we were cautiously optimistic that MELPRO 2020 will be held as planned. However the situation does not allow us to organize in-person conference and MELPRO 2020 will take place online exclusively. You can attend the program via ZOOM application and connect with the speakers.

Main objective of the MELPRO 2020 is to provide space for presentation of new research results inside the academic community; it is also open to the exchange of information between the academic and industrial spheres. The organizing committee made the best effort to fulfill the expectations. Based on this target, the following structure of the MELPRO 2020 conference topics was put together:

**New membrane materials**

**Gas, liquid and vapor separation**

**Pressure driven membrane processes**

**Electrochemical membrane processes**

**Membrane systems in water treatment, biotechnology and biomedical applications**

**Membrane operations in process engineering**

**Modelling and simulation in membrane systems**

**Membrane systems in the mining industry**

**Membrane systems in space**

**New trends in membrane applications**

**Membrane systems for new agriculture**

We continue to look forward to meeting again in person at the next conference MELPRO. Until that time please register to join us at our first online conference.

**Czech Membrane Platform**

## CHARGED NANOPOROUS MEMBRANES AS AN ALKALINE-RESISTANT SEPARATOR FOR ELECTROCHEMICAL CO<sub>2</sub> REDUCTION

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**Abstract:** The electrochemical reduction of CO<sub>2</sub> could allow to use renewable energy from wind and solar directly for the production of sustainable fuels and chemicals. Two of the current issues in CO<sub>2</sub> electrolysis are that the ion exchange membranes (IEMs) are not stable in the alkaline conditions in which electrolytic CO<sub>2</sub> reduction cells often operate, and that these membranes contribute to a substantial ohmic loss. Therefore, there is a demand for improved IEMs that are chemically stable, highly selective and conductive.

This project aims to tackle these issues using ultrathin nanoporous inorganic IEM (Fig. 1). These materials can be used as an alternative separator with selectivity based on the charge and size. The relationship between pore size, surface area and the material is studied in detail.

Ultimately, this could be achieved via a



**Fig. 1.** Selective ion transport through a positively charged nanoporous membrane.

### Reference

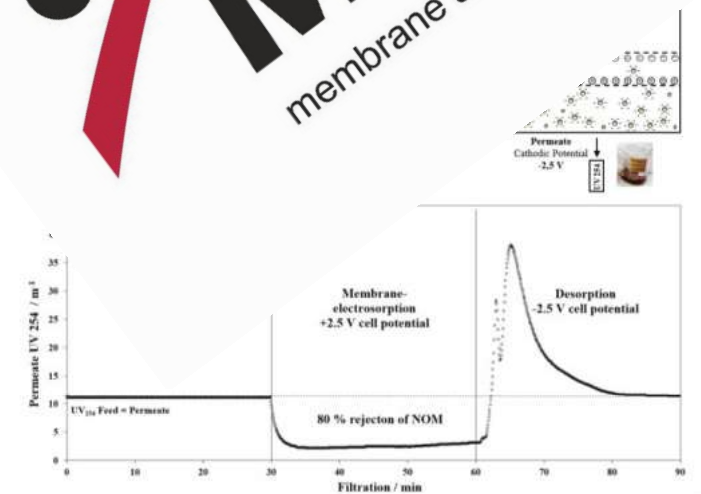
1. Gosh M., Jorissen K.F.A., Wood J.A. *et al.*, J. Phys. Chem. Lett., 9, 21, 6339-6344, **2018**.

## POSITIVELY CHARGED ELECTRICALLY CONDUCTING MEMBRANE: E-SORPTION OF NOM

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**Abstract:** Recent studies showed that electrically conducting ultrafiltration membranes exhibit several advantages regarding fouling and behavior due to the application of a cathodic electrical potential on the membrane surface. A repulsive force is induced when the membrane is charged to the same polarity as the natural organic matter (NOM). We used sputter coating to generate an electrically conducting membrane by coating the active and support membrane (pore size ~ 50 nm) with a thin layer of gold (15 nm). The novel approach of this study is the application of a cathodic (vs. anodic cell potential) to the membrane surface. During filtration, the membrane is periodically (e.g. every 10 min) switched to a cathodic potential (-2.5 V). The NOM is repelled from the membrane surface and is rejected. NOM is not rejected by the membrane.



## MODELLING ION TRANSFER THROUGH ION EXCHANGE MEMBRANES IN ELECTRODIALYSIS FOR MULTI-IONIC SOLUTIONS

S. Ozkul<sup>1</sup>, J. van Daal<sup>1</sup>, R. Bisselink<sup>2</sup>, N. Kuipers<sup>2</sup>, H. Bruning<sup>1</sup>, J. Dykstra<sup>1</sup>, H.H.M. Rijnaarts<sup>1</sup>

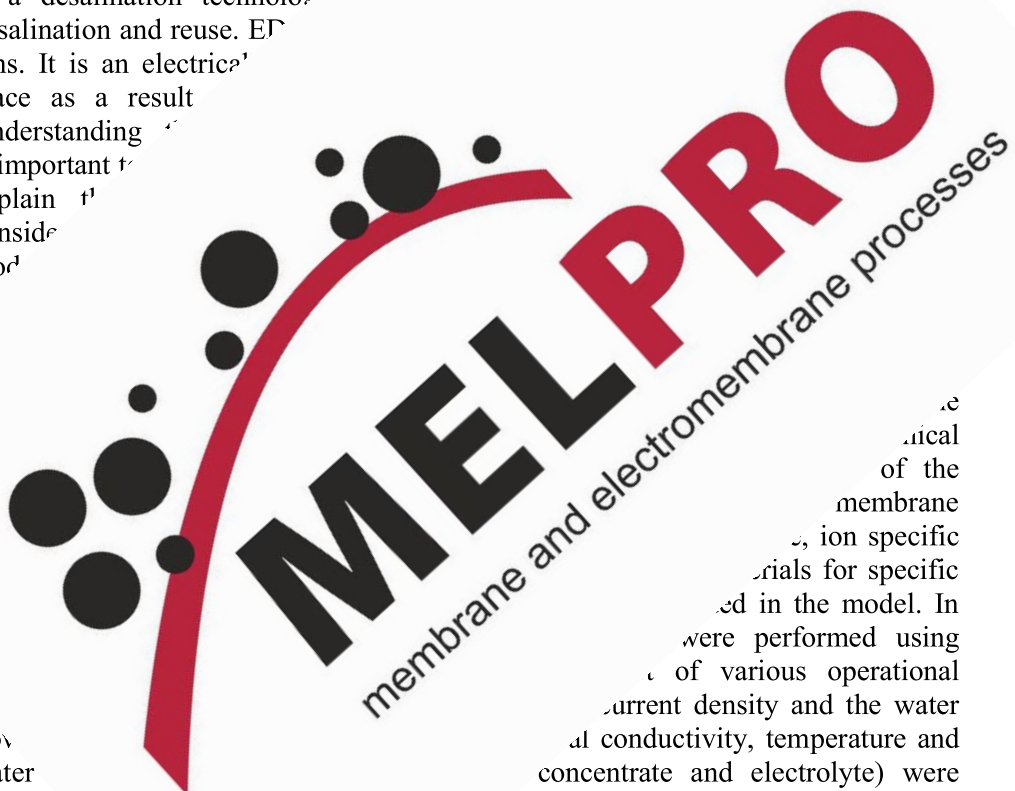
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**Abstract:** Water reuse is one of the solutions to water resources. However, continuous use of water in re-use applications. Especially in agriculture the irrigation water negatively affects crop growth. Developing ion selective membranes could in many cases increase water reuse. ED is a desalination technology for water desalination and reuse. ED processes involve ions. It is an electrically driven process. Understanding the process is important to explain the results. Consider modern

of freshwater can result in abilities for (Na+) in crop specific

flow water recorded



chemical of the membrane, ion specific materials for specific used in the model. In were performed using of various operational current density and the water al conductivity, temperature and concentrate and electrolyte) were



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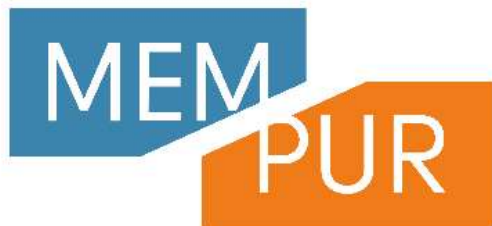
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## Membránové procesy pro udržitelný rozvoj

6. - 9. září 2021, Pardubice

[www.mempur.cz](http://www.mempur.cz)

Témata konference

Membránové procesy  
Čištění odpadních vod



The **Czech Membrane Platform (CZEMP)** associates prominent experts and institutions centred on research, development, implementation and application of membrane operations in technological processes of broad spectrum of industry. Hence, the development of the founded Platform is a prerequisite for the interconnection of research and educational subjects with production sphere and other institutions, which are engaged in technologies aiming at a constantly sustainable growth of society.

### **Basic Mission**

- CZEMP interconnects activities of professional community, academic sphere, industrial producers or users of products and technologies in the membrane area
- CZEMP ensures the transfer and stabilization of infobases concerning membrane topics and supports the education in the field
- CZEMP promotes the coordination of activities of subjects acting in the area of research and development of membrane processes, pursuing programmes and both domestic and foreign financial resources
- CZEMP supports and defends common interests of its members with the aim to popularize membrane topics and create a proper atmosphere for their development and stabilization

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