MELPRO

membrane and electromembrane processes

book of abstracts

SEPTEMBER 18–21, 2022
PRAGUE, CZECH REPUBLIC
INTERNATIONAL CONFERENCE

general sponsor

mega

BOOK OF ABSTRACTS

International Conference
on Membrane Processes

18 - 21, September 2022

Prague, Czech
Republic

Organized by CZECH MEMBRANE PLATFORM

www.czemp.cz

Book of Abstracts, MELPRO Conference, 2022
Edited by Czech Membrane Platform
Published by Czech Membrane Platform in 2022
Printed by Academic and Medical Conference Agency
1st edition, 180 copies

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

ISBN 978-80-907673-7-9
ISSN 2694-8958

TABLE OF CONTENTS

Committees ……. 8

Student Award …… 12

Preface …… 13

Abstracts of Plenary Lectures …… 14

Abstracts of Keynote Lectures …….. 19

Abstracts of Short Lectures …… 27

Abstracts of Poster Presentations …….. 118

List of the Participants …… 150

A MULTI-SCALE TOOL FOR SIMULATING ELECTRODIALYSIS WITH BIPOLAR MEMBRANES SYSTEMS

A. Culcasi[1], L. Gurreri[2], A. Tamburini[1], A. Cipollina[1], G. Micale[1]

[1] *Dipartimento di Ingegneria, Università degli studi di Palermo, Viale delle Scienze ed. 6, Palermo, 90129, Italy*

[2] *Dipartimento di Ingegneria Elettrica, Elettronica e Informatica, Università di Catania, Viale Andrea Doria 6, 95125, Catania, Italy*

Abstract: In recent years, the global capacity of the desalination industry has increased to address freshwater scarcity, with reverse osmosis established as the leading technology. Brine disposal is a major issue due to the environmental impacts. However, novel brine management methods are oriented by (near) Zero Liquid Discharge strategies towards waste disposal minimization and resource recovery. In this context, ElectroDialysis with Bipolar Membranes (EDBM) can be utilised to valorise and, thus, repurpose the waste brine, thereby producing valuable chemicals, such as acid and base solutions, and recovering desalted water. However, the EDBM system must be carefully designed to meet the process requirements. In this work, we present a mathematical multi-scale model of the EDBM technology[1]. Four different scales were integrated in the gPROMS Model Builder environment. The lowest scale predicts the physical properties at the channel level as well as the bipolar membrane transport properties. The middle-low scale simulates the triplets, i.e. the repetitive cells forming the EDBM stack. This level predicts the main electrical variables and the material balances related to transport phenomena. The middle-high scale is devoted to the prediction of shunt currents via manifolds, as well as of the flow distribution and pressure losses across the stack. Finally, the highest scale of simulation integrates the EDBM unit with the external hydraulic circuit including the reservoirs of the electrolyte solutions and other auxiliary components. The model was experimentally validated across varying operating conditions both in the steady-state and dynamic modes of operation, demonstrating a high reliability. The model capability was exploited to conduct a sensitivity analysis of the EDBM performance on the main process variables, computing Specific Energy Consumption, Current Efficiency, and Yield. Favourable process conditions and detrimental phenomena affecting this technology were identified. Finally, this powerful mathematical tool was used to design a pilot-scale EDBM unit.

Acknowledgements

The present work has been carried out thanks to the funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement no. 869474 (WATER-MINING – Next generation water-smart management systems: large scale demonstrations for a circular economy and society). www.watermining.eu.

References

1. Culcasi A., Gurreri L., Cipollina A. *et al.*, Chem. Eng. J. 437:135317, **2022**.

Book of Abstracts, Conference MELPRO 2022

Edited by:	Czech Membrane Platform
Published by:	Czech Membrane Platform, Manesova 1580, 470 01 Ceska Lipa, Czech Republic
Printed by:	Academic and Medical Conference Agency Vysehradska 320/49, 128 00 Praha, Czech Republic
Date of publishing:	9/2022
ISBN:	978-80-907673-7-9
ISSN:	2694-8958

The conference MELPRO 2022 is financially supported by
European Union – European Regional Development Fund
OP Enterprise and Innovations for Competitiveness

EUROPEAN UNION
European Regional Development Fund
OP Enterprise and Innovations
for Competitiveness

MELPRO 2022

The conference MELPRO 2022 is
supported by the Liberec Region

Liberecký kraj