Friday, July 18 – Afternoon Sessions

12:45pm Lunch Break

**Pervaporation and Vapor Permeation III (Kana’ti)**
Chair: Taizahdi Ungawi, Kansai University, Japan
Co-Chair: Iyi Huang, Membrane Technology and Research, Inc., USA
The Development of a Household Ultrafiltration System for Developing Countries
Ghobadi, A, Hameiri, M, Hameiri, M. University of Tehran, Iran
Drinking and Wastewater Applications V (Masri)
Chair: Daniel Yeh, University of South Florida, USA
Co-Chair: Chingyong Liu, Nanyang Technological University, Singapore
Coagulation Order and Membrane Properties in Permeate/Influent Stream for NF/RO Applications
Miao, W, Wu, D. Advanced Water Research Centre, Institute of Environmental Science, Singapore
Fuel Cells III (Molokai)
Chair: James McCrath, Virginia Tech, USA
Co-Chair: Michael Gruver, National Research Council of Canada, Canada
Hydrophilic Imaging Monitoring of Microfiltration Processes Using a Novel Multi-membrane Sensor
Wang, Wei, Su. Advanced Water Research Centre, Institute of Environmental Science, Singapore
Ultra- and Microfiltration III - Membranes (Honolulu/Kahuku)
Chair: William Koons, Millipore, Inc., USA
Co-Chair: Andrew Zody, The Pennsylvania State University, USA
Hydrophilic Imaging Monitoring of Microfiltration Processes Using a Novel Multi-membrane Sensor
Wang, Wei, Su. Advanced Water Research Centre, Institute of Environmental Science, Singapore
Membrane Contactors (Oahu/Waialua)
Chair: Pierre Cote, Vapemix, Canada
Co-Chair: Kyle Nijtmajer, University of Twente, the Netherlands
Modelling Aromatic Migrating Water Various Forms of Membrane Distillation Processes
Jannins, Technical University of Dortmund, Germany
Membrane Contactors (Oahu/Waialua)
Chair: Anna Bilson, Case Western Reserve University, USA
Co-Chair: Eric Back, Case Western Reserve University, USA
Modelling Aromatic Migrating Water Various Forms of Membrane Distillation Processes
Jannins, Technical University of Dortmund, Germany

2:15pm Vapor Permeation and Pervaporation as Efficient Alternatives in the Recovery of Fruit Aromas
Compounds
Duffy, O’Connell, Brazil, University, Brazil
The Development of a Household Ultrafiltration System for Developing Countries
Ghobadi, A, Hameiri, M, Hameiri, M. University of Tehran, Iran
Hydrophilic Imaging Monitoring of Microfiltration Processes Using a Novel Multi-membrane Sensor
Wang, Wei, Su. Advanced Water Research Centre, Institute of Environmental Science, Singapore

3:00pm Monitoring and Modelling of Aroma Recovery from Fermentation Media Using Permeator and Fractionated Condensation Apparatus
Ferriera, New Zealand Ltd., Auckland, New Zealand
Treatment Performance and Desalination of Coal Plant Wastewater Using an Anamolous-Amoxic-Disc Membrane Bioreactor System
Zou, Haiwu, Li, Zhe. Shanghai Dishi Green Environment Technology Co., Ltd., China
Model Studies of the Characterization of the Durability of Nonwoven Membranes and NanoComposites
Zhao, Hao, Fan, Lifu. Hirokawa University, South Western, Australia
Membrane Contactors (Oahu/Waialua)
Chair: Pierre Cote, Vapemix, Canada
Co-Chair: Kyle Nijtmajer, University of Twente, the Netherlands
Modelling Aromatic Migrating Water Various Forms of Membrane Distillation Processes
Jannins, Technical University of Dortmund, Germany

3:30pm Effect of Food Solution Characteristics on Flavor Concentration by Pervaporation
Leoni, Allouche, Cézanne Aix Marseille, Provence, France
Take Course of Sub-Micron Organic Matter in MF/RO Membrane in the MF/RO Membrane Fouling in MF/RO Membranes
Grau, Verena, Mycroft, Nathan, Cella, Frédéric. Transitec, France
Pretreatment and Desalination of Coal Plant Wastewater Using an Anamolous-Amoxic-Disc Membrane Bioreactor System
Zou, Haiwu, Li, Zhe. Shanghai Dishi Green Environment Technology Co., Ltd., China
Pretreatment of Coal Plant Wastewater Using an Anamolous-Amoxic-Disc Membrane Bioreactor System
Zou, Haiwu, Li, Zhe. Shanghai Dishi Green Environment Technology Co., Ltd., China

4:00pm Concentration of Biomimetic by Porous Hydrophobic Membranes (Honolulu)
Ungawi, Kansai University, Japan
On the Lookout for A Feeding Indicator A Critical Evaluation of Various Methods for Protein Characterization in MBR
Shukla, P, Deka, D. Indian Institute of Technology, Guwahati, India
Novel Electrolytes for Fuel Cell Electrodes
Liu, Hua, Xiao, Xiaoyi, D. Motor Engineering & Manufacturing, Ann Arbor, Michigan, USA
Effect of Food Solution Characteristics on Flavor Concentration by Pervaporation
Leoni, Allouche, Cézanne Aix Marseille, Provence, France

4:30pm Treatment of Gas Containing Hydrophobic VOCs by a Hybrid Absorption-Pervaporation Process: The Case of Toluene
Mandar, Mazzolai, University, Milan, Italy
Importance of Membrane Reactor Design for Membrane Performance in Biofuel-MBR
Hwang, J, Lee, J, Lee, J. School of Chemical Engineering, Hongik University, Korea
Effect of Hydration-Immiscible Membrane on Electrophoretic Performance of MF for Direct Methanol Fuel Cell (DMFC)
Lee, J, Lee, J, Lee, J. School of Chemical Engineering, Hongik University, Korea
Effect of Hydration-Immiscible Membrane on Electrophoretic Performance of MF for Direct Methanol Fuel Cell (DMFC)
Lee, J, Lee, J, Lee, J. School of Chemical Engineering, Hongik University, Korea

5:00pm Membrane Contactors (Oahu/Waialua)
Chair: Pierre Cote, Vapemix, Canada
Co-Chair: Kyle Nijtmajer, University of Twente, the Netherlands
Modelling Aromatic Migrating Water Various Forms of Membrane Distillation Processes
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Jannins, Technical University of Dortmund, Germany

6:00pm Packaging and Barrier Materials (Wall’ane)
Chair: Anna Bilson, Case Western Reserve University, USA
Co-Chair: Eric Back, Case Western Reserve University, USA
Modelling Aromatic Migrating Water Various Forms of Membrane Distillation Processes
Jannins, Technical University of Dortmund, Germany
Membrane Contactors (Oahu/Waialua)
Chair: Pierre Cote, Vapemix, Canada
Co-Chair: Kyle Nijtmajer, University of Twente, the Netherlands
Modelling Aromatic Migrating Water Various Forms of Membrane Distillation Processes
Jannins, Technical University of Dortmund, Germany
On the Lookout for a Fouling Indicator – A Critical Evaluation of Various Methods for Fouling Characterization in MBR

A. Drews (Speaker), TU Berlin, Berlin, Germany - anja.drews@tu-berlin.de
T. de la Torre, Berlin Centre of Competence for Water, Berlin, Germany
V. Iversen, TU Berlin, Berlin, Germany
J. Schaller, TU Berlin, Berlin, Germany
J. Stüber, Berlin Centre of Competence for Water, Berlin, Germany
F. Meng, TU Berlin, Berlin, Germany
B. Lesjean, Berlin Centre of Competence for Water, Berlin, Germany
M. Kraume, TU Berlin, Berlin, Germany

Objectives Fouling still is a major issue in membrane research in general and in MBR research in particular. A multitude of manuscripts on fouling are constantly submitted. Despite all this effort, neither the culprit components nor the exact mechanisms are known and results are even contradictory to some extent. The main reasons for this are: 1) A wide variety of experimental, sample preparation but also evaluation methods are used in different groups. E.g., critical flux in its strictest form is agreed to be unattainable [1], so identification of the onset of the so-called critical flux is rather arbitrary. 2) Due to the complexity of the systems, researchers jumped to conclusions on observing any correlations at all. In the light of this it is not surprising that plenty of different fouling indicators are in use. The aim of this paper is not to add just another study on fouling but to step back and evaluate ‘traditional’ and new characterisation methods. Using a large variety of characterisation tools in a standardised way to monitor a number of different plants over several months, a pool of data was gained that will lead to more generally valid information on a) suited characterisation methods and b) suited data evaluation methods and hopefully c) culprit fouling components.

Methods Fouling propensity and mixed liquor characteristics were monitored regularly in 6 MBR plants (10 L to 250 p.e.) over a period of several months. In total, 10 chemical and physical mixed liquor characterisation methods were applied (polysaccharides and proteins in EPS and SMP [2, 3], CST, TTF, biopolymers via LC/OCD), including the novel TEP (transparent exopolymer particles) method [4] which yields information on a hitherto undetected fraction of polymers, and 2 different filtration test cells (ex situ sidestream and a novel in situ immersed). In the filtration experiments which were carried out to assess the individual fouling propensity of different sludges in a comparative manner, 3 different critical flux protocols and 2 data evaluation methods were compared (average TMP during each step and dTMP/dt [1]). This campaign is supplemented by data gained with the DfCm method [5].
Results Critical flux measurements with sludges from 4 different plants showed that critical flux varies over time but is surprisingly similar in the investigated plants despite the fact that that chemical parameters like SMP and EPS differ by more than 100%. The different evaluation methods yielded variations within the range of normal change in feed behaviour (±20%). Due to the elimination of unfed and unaerated feed transport from MBR to filtration test rig, in situ filtration tests were thought to be superior [6]. Of the three protocols used, two gave a similar outcome while the result of protocol I (without relaxation between flux steps) was completely different. This shows the importance of standardising critical flux protocols for comparison of data. On cross-evaluating several results of chemical and physical analyses, no clear relationships could be observed. CST as a first tentative measure of filterability only gave a correlation with TEP concentrations [4]. While all other alleged chemical indicators vary quite a lot, critical flux remains pretty stable (see above).

Conclusions The applied large variety of fouling characterisation methods based on both physical and chemical analyses of the mixed liquor and supernatant over several months of operation of various plants will allow a more generally valid conclusion on the practical use of different assessment methods. Comparative short-term filtration tests like critical flux trials were further improved by an in situ set-up that eliminates unfed and unaerated sample storage. The applicability of the novel TEP method has been shown. So far, ‘traditional’ indicators like SMP and EPS gave no clear correlation with filterability. At the conference, more data of the ongoing campaign will be presented and cross-evaluated.

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References