Date	Session	Room	Time	Title	Authors	Change
Mon. July 14	NF/RO I - Membranes	Maui	14:15-15:00	Development of Reverse Osmosis FT-30 Membranes with Polyethylene Oxide Brush Modified Antifouling Surface	Jason Niu, Bill Mickols (C,P), Jim Thorpe, Abrahim Abaye	Cancelled
Mon. July 14	NF/RO I - Membranes	Maui	14:15-15:00	New frontiers in Reverse Osmosis – Anti-biofouling Spacers	Isabel C. Escobar (C,P), Richard Hausman, Tilak Gulinkala	Added to Program (see attached abstract)
Mon. July 14	Posters I	Lana'i	18:30-21:30	7. Characterization of Nanoporous Membranes of PVDF-g-PMMA synthesized by ATRP	Dar-Jong Lin (C,P), Liao-Ping Cheng, Chun-Liang Lin	Cancelled
Mon. July 14	Posters I	Lana'i	18:30-21:30	30. Influence of organic matter fouling on removal of micropollutants by nanofiltration	Suzuki Takuya (C,P), Fukushi ken-ichi	Cancelled
Mon. July 14	Posters I	Lana'i	18:30-21:30	110. Preparation and Characteristics of Anion Exchange Resin Mixed Poly(ether sulfone) Hybrid Membranes	Yuzhong Zhang (C,P), Ru Jia, Zecheng Wang, Hong Li	Cancelled
Tues. July 15	Membrane and Surface Modification I	Wai'anae	14:15-17:30	Error in Program Book	Chair: Young Moo Lee (China)	Chair: Young Moo Lee (Korea)
Tues. July 15	Membrane and Surface Modification I	Wai'anae	14:15-15:00	New Chemically Modified Membranes in Bioseparations	Dieter Melzner (C,P), Rene Faber	Cancelled
Tues. July 15	Membrane and Surface Modification I	Wai'anae	14:15-15:00	Modifications and applications of fluoropolymer-based membranes by surface-initiated grafting polymerizations	Ying-Ling Liu (C,P)	Added to Program (see attached abstract)
Tues. July 15	Posters II	Lana'i	18:30-21:30	116. PAN-MgO nanocomposite ultrafiltration membranes with improved anti-fouling properties	Fubing Peng (C,P), Zhuo Su, Shengpei Su	Cancelled
Tues. July 15	Posters II	Lana'i	18:30-21:30	186. Fundamental Mechanisms of Three-Component Combined Fouling with Experimental Verification	Alison Harris (P), Albert S. Kim (C), Qilin Li, Rong Yuan	Added to Program (see attached abstract)
Wed. July 16	Membrane Modeling III - Process Simulations	O'ahu/Waialua	10:45-11:15	CFD Modeling for the Concentration of Soy Protein in an Ultrafiltration Hollow Fiber Membrane System Using Resistance-in-Series Model	Amin Reza Rajabzadeh (C,P), Bernard Marcos, Christine Moresoli	Cancelled
Wed. July 16	Membrane Modeling III - Process Simulations	O'ahu/Waialua	10:45-11:15	Hydrogen permeation in thin palladium silver membranes: comparison between experimental data and model calculations	Jacopo Catalano, Mirella Coroneo, Marco Giacinti Baschetti (P), Giuseppina Montante, Alessandro Paglianti, Giulio C. Sarti (C)	Added to Program (see attached abstract)

Date	Session	Room	Time	Title	Authors	Change
Thurs. July 17	Gas Separation IV	Kaua'i	10:30-11:00	Carbon Membranes - Tackling the Aging Issue	Edel Sheridan (C,P), Jon Arvid Lie, Xuezhong He, May-Britt Hägg	Title changed to "Production of Carbon Membranes with an Online Regeneration Technique"
Thurs. July 17	Posters III	Lana'i	18:30-21:30	24. CONCENTRATION OF BLACKCURRANT JUICE (Ribes nigrum) BY REVERSE OSMOSIS ON A PILOT SCALE	Nora Pap (C,P), Eva Pongrácz, Auli Turkki, Mari Jaakkola, Vesa Virtanen, Liisa Myllykoski, Gyula Vatai, Riitta L. Keiski	Cancelled
Thurs. July 17	Posters III	Lana'i	18:30-21:30	52. Effect of organic or inorganic materials in hybrid process of ceramic MF and GAC adsorption for drinking water treatment	Hyuk Chan Lee (C), Jin Yong Park (P)	Hyuk Chan Lee (P), Jin Yong Park (C)
Thurs. July 17	Posters III	Lana'i	18:30-21:30	61. Lake water treatment using tubular alumina microfiltration membrane system with periodic N2-backflushing	Hyuk Chan Lee (C,P), Sung Jae Park, Keun Soo Kim, Jin Yong Park	Hyuk Chan Lee, Sung Jae Park, Keun Soo Kim, Jin Yong Park (C,P)
Thurs. July 17	Posters III	Lana'i	18:30-21:30	145. Evaluation of Submerged Membrane Filtration using Intermittence Aeration Filtration Method	Choi Byong-Bo (P), Oh Hyunje, Lee Sangho (C), Choi June-Seok	Added to Program (see attached abstract)
Thurs. July 17	Posters III	Lana'i	18:30-21:30	146. Design of an Economic and Efficient SWRO Pilot Plant	June-Seok Choi (P), Hyun-Je Oh, Young-Jun Choi, Boksoon Kwon, Byeong-Bo Choi, Sangho Lee (C)	Added to Program (see attached abstract)
Fri. July 18	Drinking and Wastewater Applications V	Maui	15:00-15:30	Treatment Performance and Detoxification of Coke Plant Wastewater Using an Anaerobic-Anoxic-Oxic Membrane Bioreactor System	Wentao Zhao (C,P), Xia Huang, Duujong Lee, Miao He	Cancelled
Fri. July 18	Drinking and Wastewater Applications V	Maui	15:00-15:30	Development of Nanofiltration/Steam Stripping Sequence for Coke Plant Wastewater Treatment	Miguel Minhalma (C,P), Maria Norberta de Pinho	Added to Program (see attached abstract)

Session
NF/RO I – Membranes Monday July 14, 2008 (14:15-15:00, Room: Maui)

Title
New frontiers in Reverse Osmosis – Anti-biofouling Spacers

Authors
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Abstract
Biofouling, which is the accumulation of microorganisms onto the membrane surface and on the feed spacer, is a very prominent problem in the use of reverse osmosis (RO) membranes. In the past, research and development of biofouling prevention has commonly focused on the pretreatment of the feed water, the improvement of cleaning solutions and procedures, and modifications to the membranes themselves. This research focuses on developing anti-biofouling polypropylene (PP) feed spacers. This is particularly significant because membrane replacement due to fouling is the single largest operating cost in water separation (Escobar et al. 2005).

PP was functionalized via the addition of a spacer arm with metal chelating ligands. These ligands were charged with copper or silver ions to allow for slow release of metals into the feed water in the membrane systems. Copper and silver ions have been previously used to disinfect water against microbial life because the ions interfere with enzymes involved in cellular respiration, and they bind DNA at specific sites. This functionalization was chosen as the focus because these chelating ligands are quite stable and easily synthesized, operate over a diverse range of conditions, have easily controlled binding affinities, and are well suited for model studies. In this research, the spacer arm was glycidyl methacrylate (GMA) which was polymerized to the PP using benzoyl peroxide as a radical initiator. Iminodiacetic acid (IDA) was then added to the end of the GMA spacer arm and to allow for the chelatation of the copper and silver ions.

Characterization of the PP modification was performed using Fourier transform infrared spectroscopic (FITR), atomic force microscopy (AFM), scanning electron microscopy (SEM) and mechanical strength measurements. The effects on the biological content of water in the presence of the modified spacer were tested using a synthetic water matrix of sterile phosphate buffer solution containing Pseudomonas fluorescens P17 and Spirillium volutans strain NOX. Both modified and unmodified spacers were contacted with the feed water for 2 weeks to allow for growth and then placed in stomacher bags where the

biofilm was removed. R2A Agar spread plates will then be made for each specimen and bacterial growth were quantified using a Model 920A Colony Counter.

References: Escobar I., Hoek, E., Gabelich, C., F. DiGiano, Y. Le Gouellec, Berube, P., K. Howe, J. Allen, K. Atasi, M. Benjamin, P. Brandhuber, Brant, J.A., Chang, Y., Chapman, M., A. Childress, W. Conlon, T. Cooke, I. Crossley, G. Crozes, P. Huck, S. Kommineni, J. Jacangelo, A. Karimi, J. Kim, D. Lawler, Q. Li, L. Schideman, S. Sethi, J. Tobiason, T. Tseng, S. Veerapaneni, and A. Zander, American Water Works Association Membrane Technology Research Committee Report: Membrane Fouling - Recent Advances and Research Needs, Journal American Water Works Association, 97 (8), 2005, pages 79-89.

Session
Membrane and Surface Modification I Tuesday July 15, 2008 (14:15-15:00, Room: Wai'anae)

Title
Modifications and applications of fluoropolymer-based membranes by surface-initiated grafting polymerizations

Authors
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Abstract
Surface modification can alter the surface properties and remain the bulk features of membranes, so as to be attractive in membrane designs and fabrications. Moreover, surface-functionalization on membranes might also be done via proper surface modification to bring some specialized functions and to extend the applications scopes of membranes. Here the developments of surface-modification approaches on fluoropolymers are discussed, as such polymers have been widely used as membrane materials for their attractive properties, such as chemical resistance.

Surface modification on fluoropolymer films, including PVDF and PTFE, were performed with surface-initiated polymerizations, including conventional radical and controlled radical polymerizations, to incorporate well-controlled polymer structures and functionality to the polymer surfaces. The modified polymer films were applied to fabrication of PTFE-based thin-film composite membranes for pervaporation dehydrations. In addition, membranes for bio-separations having low-fouling characteristics were also obtained and discussed.

Session
Posters II Tuesday July 15, 2008 (#186, Room: Lana'i)

Title
Fundamental Mechanisms of Three-Component Combined Fouling with Experimental Verification

Authors
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Abstract
Basic fouling mechanisms of nanofiltration (NF) membranes by macromolecules and colloidal particles in the presence of solute ions are individually well understood at a fundamental level using sophisticated experiments and/or mathematical modeling approaches. However, major fouling phenomena in water and wastewater filtration systems are ascribed to complex interactions between various fouling components, and fouling is further influenced by physical and chemical properties of membrane surfaces. For example, interactions between colloidal particles with dissolved organic macromolecules contribute to noticeable deviations in filtration performance from predictions based on the superposition of individual fouling mechanisms. In this study, we choose three model foulants, i.e., nano-sized silica colloids, BSA macromolecules, and solute ions to investigate the mechanisms of NF membrane fouling by the tertiary mixture using dead-end filtration. Filtration experiments will evaluate fouling of an NF membrane by three types of foulant solutions – BSA alone, silica alone, and a mixture of BSA and silica under solution conditions covering a range of pH and ionic strength. A cell model approach coupled with Darcy's law is used to rigorously mimic the filtration of the tertiary system under different operation conditions.

Session
Membrane Modeling III - Process Simulations Wednesday July 16, 2008 (10:45-11:15, Room: O'ahu/Waialua)

Title
Hydrogen permeation in thin palladium-silver membranes: comparison between experimental data and model calculations

Authors
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Abstract
The permeability of hydrogen selective Pd-Ag based membranes, manufactured by NGK Insulator LTD, was studied under different experimental conditions. The membranes were obtained by depositing, through electroless plating a palladium-silver layer (20 % wt Ag) onto ceramic porous supports targeting a film thicknesses of 2.5μm. The permeance was measured at the three temperatures of 673, 723, 773 K, with total trans-membrane pressures ranging between 0.5 and 6 bar, using feeds of pure H2 and N2, as well as hydrogen mixtures. The membranes exhibited excellent behaviour, maintaining a virtually infinite selectivity throughout the testing and good fluxes, among the higher reported in literature for similar membranes. Pure gas permeation results is accurately described by Sieverts' law and confirmed the presence of a transport process characterized by the diffusion of atomic hydrogen through the Pd-Ag layer as limiting step. Interestingly the transfer rate is found to be definitely reduced by the use of H2/N2 mixtures and deviation from the Sieverts' law can be noticed in such conditions. Furthermore, while pure gas permeability is not influenced by changes in the feed flow rate, the permeate flux in mixture experiments definitely increased by increasing the feed flow rate. That strongly suggests the existence of a further resistance to transport in the gas phase which has been investigated both through simple model equations as well as with the aid of CFD software to simulate the fluid dynamics of the membrane permeation module.

Use of a plug flow approximation with a boundary layer relationship for the transport coefficient offers a good representation of the results experimentally observed. A more

detailed simulation of the membrane a apparatus was also obtained through the numerical solution of the Navier-Stokes and local species balance equations in the three dimensional domain representing quite closely the selected module geometry. The membranes was modelled as a selective layer, which allows the permeation of different components according to the appropriate transport mechanism and driving force applied. Three different transport mechanisms were considered: molecular diffusion (self and mutual), Knudsen diffusion and Sieverts' law obtaining an excellent agreement between the experiments and the predicted data and obtaining a number of additional information on the working conditions of the module used for the experimental analysis. In particular, the CFD simulations allowed to evaluate accurately the convective mass transfer resistance in the module and highlighted the existence of stagnant and recirculating zones which decreased the overall efficiency of the permeation module when mixed gases are used.

Session
Posters III Thursday July 17, 2008 (#145, Room: Lana'i)

Title
Evaluation of Submerged Membrane Filtration using Intermittence Aeration Filtration Method

Authors
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Abstract
Submerged microfiltration (SMF) has proven to be effective for the removal of particles and microorganisms under low operation pressures. However, a major challenge to further application of SMF process in water treatment plants is to solve the problem of flux reduction by contaminants or foulants in the source water supply. Source water supply is an important index to determine the process design and operation methods in membrane filtration system. Especially, the turbidity and algae at high concentration induce severe fouling reducing permeate flux and result in reducing the interval of backwashing and chemical cleaning. The coagulation/flocculation and sedimentation processes have been commonly applied as pretreatments in membrane filtration system to remove fouling materials. But these processes require space and high construction cost. Therefore, the intermittence aeration filtration method (IAF) in SMF process, an alternative for the conventional pretreatments, was investigated in this study. In IAF process, air scouring intensity and the dosage of coagulant and chemical cleaning agents were determined by fouling index based on both turbidity and algae. In other words, the intermittent aeration by extending interval and continuous aeration were utilized under low and high turbidity, respectively. It is effective for fouling reduction and energy saving. Furthermore, the dosage of coagulant and chemical cleaning agents were adjusted according to algae concentration. The objective of this study was to evaluate IAF methods in SMF process under various operating conditions. The Han River in Korea was used as feed water and poly aluminum chloride (17 %) and NaOCl (12%) were used as coagulant and cleaning reagents, respectively. The number of algae significantly increased in spring and fall and very high turbidity occurred in the rainy season. A

submerged microfiltration system of pilot scale with treatment capacity of 500 m3/day was tested and hollow fiber modules (Cleanfil S-20, Kolon Filter, Korea) were equipped into this filtration system. The results of IAF clearly demonstrated that it is more effective than continuous aeration filtration system showing energy saving of 40 % and reduction of 50 % for coagulant dosage under operating conditions such as the flux of 38 LMH and recovery of 90%.

Session
Posters III Thursday July 17, 2008 (#146, Room: Lana'i)

Title
Design of an Economic and Efficient SWRO Pilot Plant

Authors
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Abstract
The overall goal of this project is to secure global top technologies for designing and constructing large-scale seawater desalination plants. Thus, we focus on developing practical technologies to evaluate domestic (Korean-made) devices, including reverse osmosis membranes and high pressure pumps, and to apply them in a pilot plant and a test-bed, which is a key to localization of core technologies and equipments. Our research is including the objectives that development of evaluation technologies for domestic equipments including RO membrane modules and high pressure pumps and application of such equipments to a full scale desalination plants (so-called □test bed□). So we are accomplishing consequently that development of analytical techniques for energy efficiency of seawater desalination plants using domestic devices. And design and operation of a large scale pilot plant (1000 m3/day) to develop a process with high localization ratio. The research on seawater desalination plant has huge impact on related industries because it combines multi discipline technologies in civil, construction, environmental, chemical, mechanical, and/or electronic engineering.

Session
Drinking and Wastewater Applications V Friday July 18, 2008 (15:00-15:30, Room: Maui)

Title
Development of Nanofiltration/Steam Stripping Sequence for Coke Plant Wastewater Treatment

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Abstract
The present work proposes the optimisation of an integrated process that consists in the coupling of Nanofiltration (NF) with Steam Stripping for the treatment of ammoniacal wastewaters contaminated by cyanides ions and phenols. These wastewaters are fractionated by NF into an ammonium concentrate and an ion-containing permeate stream. The concentrates are further fractionated in the steam stripping column.
The NF experiments were performed with a DSS plate and frame Lab-Unit 20, equipped with a HR-98-PP membrane. The NF experiments were run in concentration mode to optimise the concentrate ammonium content/permeate flux as a function of water recovery ratio (*RR*).
The optimisation of the NF/steam stripping integrated process was carried out with a sequential process simulator.
The optimisation study showed that the NF should work at a recovery ratio of 40%. At this RR the ammonium can be efficiently concentrated and purified from cyanides at reasonable permeate flow rates. The column steam consumption was also optimised as a function of the NF concentrates flowrate. The integrated process leads to an increase of the stripping efficiency and to significant energy savings.

Keywords: *Nanofiltration, Steam Stripping, Coke Plant Wastewater, Fractionation*