Preface

Membranes have found a confirmed position in the water community. The membrane market is seen as the strongest and fastest growing market in the water industry. Pressure driven membrane processes take place all over the world and are simply indispensable to produce water of a particular high quality. Membranes can be combined with almost the complete range of conventional processes and, in many cases, hybrid processes are even more effective than the single processes in series. Depending on their type and material or the specific process in which membranes are incorporated, they can be used for an extraordinarily broad range of treatment objectives. If the objective is desalination, the practically complete removal of particulate or colloidal matter, of microorganisms, or even of trace organic pollutants can be achieved; if the objective is the concentration of activated sludge in bioreactors, membranes usually succeed.

The present Theme Issue of *Journal of Water Supply: Research and Technology–AQUA* covers several papers dealing with Membranes in Drinking Water Production. Like the wide-ranging potential applications of membrane technology, the topics of the papers vary widely as well.

Combining microfiltration (MF) or ultrafiltration (UF) with coagulation is nowadays seen as a powerful hybrid process. On the one hand, dosing of a coagulant decreases considerably membrane fouling and, on the other hand, increases the otherwise low NOM removal of porous membranes. In the study of Meyn & Leiknes (2010), different coagulants have been used under varying coagulation/flocculation conditions to investigate the respective impact on the performance of a ceramic MF. Papers investigating other types of hybrid process are included in this issue. Dixon *et al.* (2010) demonstrated that MF combined with MIEX pre-treatment significantly improved the lifetime of membrane. Immobilization of a catalyst on anion exchange resin was examined by Kim *et al.* (2010); they used the catalyst-immobilized resin with UF and found that selected pharmaceuticals and endocrine disrupting chemicals were effectively removed.

Biofouling is still seen as one of the major hindrances in spiral wound membrane elements used for reverse osmosis (RO) or nanofiltration (NF) processes. Duiven *et al.* (2010) show in their paper that the dosing of antiscalants can significantly contribute to biofouling. They introduce the Membrane Fouling Simulator as a method to determine the biofouling potential of different antiscalants.

The removal of particulate fouling from spiral wound membrane elements is investigated using frequent air/water cleaning by Cornelissen *et al.* (2010). They demonstrate this method as effective in removing the accumulated mass of particulates in the feed spacer.

Another approach of cleaning UF capillary membranes is presented by Li *et al.* (2010*a*). In their paper they show that backwashing with demineralized water substantially improves the fouling control efficiency.

Sea water desalination is nowadays seen as one of the most important technological solutions to meet the challenge of the world water crisis, but is it really a "green" technology? In order to answer this question Lattemann *et al.* (2010) describe in their paper a general BAT (Best Available Technology) approach for SWRO plants focusing on the resource consumption of the different processes as well as methods of operation and their likely environmental impacts.

Nanofiltration (NF) membranes are widely used to produce softened water from brackish sources, but have become more and more important for treating surface water containing natural organic matter. In this case specific inorganic compounds like manganese can be removed as well. In this context, De Munari & Schäfer (2010) investigated the impact of the speciation of manganese on the removal of manganese and organic matter by NF. Treating surface waters by NF usually causes fouling, which was investigated by Makdissy *et al.* (2010). The authors used

doi: 10.2166/aqua.2010.100

several techniques to conduct detailed investigations of fouling layers arising on four different NF membranes by treating two surface waters that differed substantially in major properties. Ion transport mechanisms in NF were systematically investigated by Park *et al.* (2010) who pointed out the importance of the influence of nano-colloids.

Application of model calculations to membrane processes is still a challenge but promising. Two papers dealt with this topic, both of which were carried out with submerged MF processes. Li *et al.* (2010*b*) used computational fluid dynamics (CFD) to estimate the shear stress on the membrane while Erdei *et al.* (2010) employed an artificial neural network (ANN) to predict permeate quality and membrane fouling. In summary we are highly pleased to deliver a Theme Issue assembled with several high quality research papers covering a wide spectrum of different topics related to the production of potable water by membranes. We appreciate the contributions by the authors, reviewers, and editorial staff of IWA to this project and we would be pleased to receive comments and suggestions you may have about this Theme Issue.

Stefan Panglisch
IWW Water Centre/Department Water Technology
Muelheim, Germany

Katsuki Kimura
Hokkaido University
Sapporo, Japan

Gary Amy
King Abdullah University of Science and Technology
Saudi Arabia

REFERENCES

Cornelissen, E. R., Viallefont, X. D., Beerendonk, E. F. & Wessels, L. P. 2010 Air/water cleaning for the control of particulate fouling. *JWSRT–AQUA* **59**(2–3), 120–127.

De Munari, A. & Schäfer, A. I. 2010 Impact of speciation on removal of manganese and organic matter by nanofiltration. *JWSRT–AQUA* **59**(2–3), 152–163.

Dixon, M. B., Morran, J. Y. & Drikas, M. 2010 Extending membrane longevity by using MIEX as a pre-treatment. *JWSRT–AQUA* **59**(2–3), 92–99.

Duiven, J., Rietman, B. & van de Ven, W. 2010 Application of the membrane fouling simulator to determine biofouling potential of antiscalants in membrane filtration. *JWSRT–AQUA* **59**(2–3), 111–119.

Erdei, L., Vigneswaran, S. & Kandasamy, J. 2010 Modelling of submerged membrane flocculation hybrid systems using statistical and artificial neural networks methods. *JWSRT–AQUA* **59**(2–3), 198–208.

Kim, S., Kim, J. H., Yoon, T. B., Lee, C. H., Kwon, H. H. & Lim, D. J. 2010 Removal of trace organic pollutants and removal mechanisms using catalyst-immobilizes resin/ultrafiltration hybrid system. *JWSRT–AQUA* **59**(2–3), 100–110.

Lattemann, S., Kennedy, M. D. & Amy, G. 2010 Seawater desalination–a green technology? *JWSRT–AQUA* **59**(2–3), 134–151.

Li, S., Heijman, S. G. J. & van Dijk, J. C. 2010*a* A pilot-scale study of backwashing ultrafiltration membrane with demineralized water. *JWSRT–AQUA* **59**(2–3), 128–133.

Li, H., Nagaoka, H., Itonaga, T. & Nakahara, Y. 2010*b* Estimation of shear stress working on submerged vertically set hollow fibre membrane in MBRs. *JWSRT–AQUA* **59**(2–3), 191–197.

Makdissy, G., Huck, P. M., Reid, M. M., Leppard, G. G., Haberkamp, J., Jekel, M. & Peldszus, S. 2010 Investigating the fouling layer of polyamide nanofiltration membranes treating two different natural waters: internal heterogeneity yet converging surface properties. *JWSRT–AQUA* **59**(2–3), 164–178.

Meyn, T. & Leiknes, T. 2010 Comparison of optional process configurations and operating conditions for ceramic membrane MF coupled with coagulation/flocculation pre-treatment for the removal of NOM in drinking water production. *JWSRT–AQUA* **59**(2–3), 81–91.

Park, N., Cho, J., Hong, S. & Lee, S. 2010 Ion transport characteristics in nanofiltration membranes: measurements and mechanisms. *JWSRT–AQUA* **59**(2–3), 179–190.