ICOM 2011

Book of abstracts

Welcome

It is our great pleasure to welcome you at the International Congress on Membranes and Membrane Processes (ICOM 2011) organized by the Membrane Technology Group of the University of Twente, The Netherlands and held at the RAI convention center in Amsterdam from July 23-29, 2011.

We tried to compose an interesting and inspiring program covering the broad spectrum of topics in the field of membrane science and technology. We invited three plenary speakers from areas closely related to, though still at a certain distance from the field of membranes, to broaden the scope of the program and generate discussion and new insights. The program covers 78 keynote lectures at the start of each conference session, giving an overview of the past and future developments in that specific field. Next to that, it consists of almost 400 oral and more than 600 posters presentations, from students as well as from senior scientists in the field.

The social program includes a welcome reception and an exclusive boat tour from the convention center, through the canals of the old city of Amsterdam, to the former stock exchange building where the conference dinner will take place.

We would like to take the opportunity to express our sincere gratitude to the members of the organizing committee for all their efforts and altruistic support at the expense of their own work. Thank you very much. Without your help, ICOM 2011 would not have been possible!

We are very grateful to our sponsors and we highly value their financial support. Finally we would like to thank all members of the membrane community for their contributions and help to make this conference a success. We appreciate your input.

We wish you a wonderful ICOM 2011 and hope you will have a great time!

Kindest regards,

Kitty Nijmeijer
Antoine Kemperman
Matthias Wessling

Chairs ICOM 2011

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ICOM118

Novel asymmetric interpenetrating proton-conducting membrane

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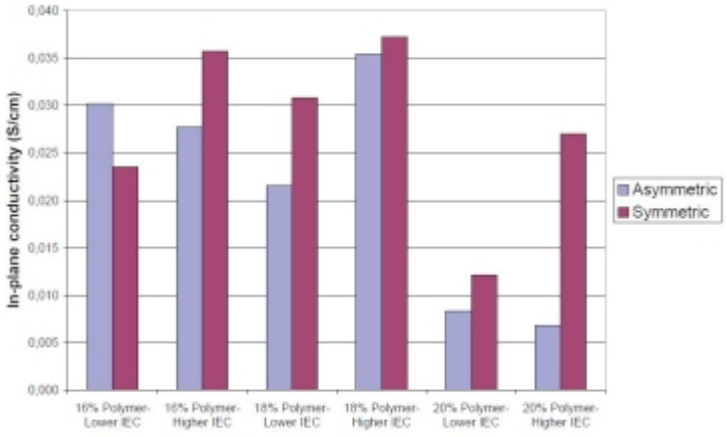
Fuel cells comprising proton-conducting polymer membranes are focus of active research due to their versatile applications as energy sources in the automotive, stationary and portable fields. A fluoro-ionomer membrane, such as Nafion available from Du Pont de Nemours, is commonly used for these applications. High price of these membranes and their limitations, such as high crossover of methanol in Direct Methanol Fuel Cells and performance loss under conditions of low relative humidity, have led to investigations of other proton-conducting membranes from less expensive, nonfluorinated materials.

Proton-conducting membranes with interpenetrating polymer network morphology have been a subject of growing interest in recent years [1]. These materials are generally prepared by either in situ polymerization and cross-linking starting from initial reactants, or by sequential synthesis starting from a polymer network swollen with necessary precursors that subsequently react to form the interpenetrating structure within the first network. An interplay of the chemical reaction and liquid-liquid demixing kinetics has a determining effect on the final membrane morphology. Interpenetrating domains of relatively small size are typical, as opposed to
macroscopic phase separation observed in most polymer blends. Such fine morphology of interpenetrating proton-conducting membranes often leads to improvement in mechanical strength and reactant barrier properties.

Novel asymmetric membranes comprising proton-conducting channels of cross-linked sulfonic acid functionalized ionomers embedded within a matrix of thermally resistant, glassy polymer were prepared and evaluated in our laboratories. These membranes have an integral top skin layer with fine biomimetic proton-conducting channels, which provides a barrier against methanol crossover, on top of a coarser proton-conducting support. Conductivity of asymmetric membranes over a range of initial polymer concentrations and ion-exchange capacities (IEC) was just slightly lower than for the corresponding symmetric membranes. These conductivity measurements were carried out using a 4-point in-plane method. It is expected that the planned measurements in the direction of membrane thickness will result in significantly higher conductivities due to
the anisotropic membrane morphology.



In conclusion, a reduction in the thickness of these novel membranes should result in a lower ohmic resistance, while still maintaining the methanol barrier properties, which would lead to improved fuel cell performance and lower production costs compared to the commercial proton-conducting membranes.

1/ Chikh, L. et al., *(Semi-)Interpenetrating polymer networks as fuel cell membranes*, J. Membrane Sci. (2010), doi:10.1016/j.memsci. 2010.11.020.