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7. I declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct.

DATE: January 13, 2024

Nathaniel E Frank-White

Nathaniel E Frank-White

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Journal of Membrane Science
Volume 474, In Progress (15 January 2015)

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Reviews

Recent advances in membrane distillation processes: Membrane development, configuration design and application exploring Review Article
Pages 39-56
Peng Wang, Tai-Shung Chung
Abstract | Close research highlights | Purchase PDF - $35.95

Highlights

- This review aims to summarize the recent advances in membrane distillation (MD) and provide perspectives for its future R&D.
- The development of MD membranes was reviewed from different aspects as material, micro-structure and macro-geometry.
- The traditional and new configuration designs with improved energy efficiency were summarized.
- Various applications and MD based hybrid systems were reviewed comprehensively.

Original Research Papers

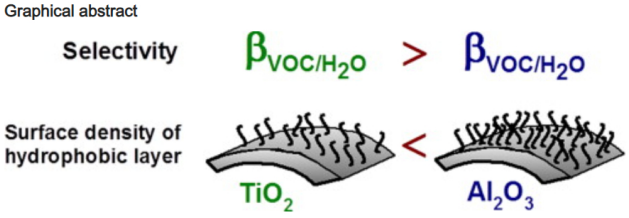
Structural optimization of membrane-based biogas upgrading processes Original Research Article
Pages 1-10
Marco Scholz, Michael Alders, Theresa Lohaus, Matthias Wessling
Abstract | Close research highlights | Purchase PDF - $35.95

Highlights

- Process optimization model for gas permeation.
- New biogas upgrading process.
- Identifying optimal membrane materials.

Removal of hazardous volatile organic compounds from water by vacuum pervaporation with hydrophobic ceramic membranes Original Research Article
Pages 11-19
Joanna Kujawa, Sophie Cerneaux, Wojciech Kujawski
Abstract | Close graphical abstract | Research highlights | Purchase PDF - $35.95

Graphical abstract



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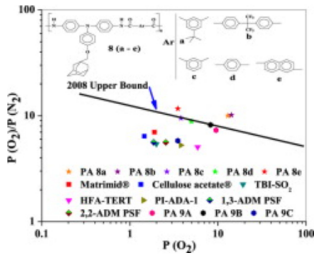
Highly gas permeable aromatic polyamides containing adamantane substituted triphenylamine Original Research Article

Pages 20-31

Debaditya Bera, Parthasarathi Bandyopadhyay, Sipra Ghosh, Susanta Banerjee, Venkat Padmanabhan

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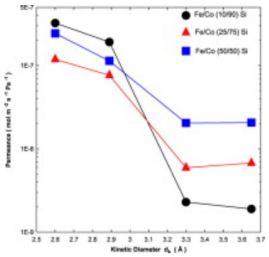
Binary iron cobalt oxide silica membrane for gas separation Original Research Article

Pages 32-38

Adi Darmawan, Julius Motuzas, Simon Smart, Anne Julbe, João C. Diniz da Costa

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First principles study of N and H atoms adsorption and NH formation on Pd(111) and Pd3Ag(111) surfaces Original Research Article

Pages 57-63

Bhume Chantaramolee, Allan Abraham B. Padama, Hideaki Kasai, Yogi Wibisono Budhi

Abstract | Close research highlights | Purchase PDF - $35.95

Highlights

- N, H, NH adsorption and NH formation on Pd(111) and Pd_3Ag(111) surfaces were studied.
- Adsorption energies of N and NH are weakened when they adsorb near Ag alloy atom.
- H atom adsorption energies are comparable on both Pd(111) and Pd_3Ag(111) surfaces.
- N adsorption suppresses H adsorption energies nearby and Pd_3Ag(111) shows less suppression.
- Activation barrier for NH formation across Ag of Pd_3Ag(111) is raised by 0.2–0.3 eV.

Mathematical modeling of CO_2 separation from gaseous-mixture using a Hollow-Fiber Membrane Module: Physical mechanism and influence of partial-wetting Original Research Article

Pages 64-82

Nikhil Goyal, Shishir Suman, S.K. Gupta

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Highlights

- Comprehensive mechanistic modeling of CO_2 separation from gaseous-mixture.
- Mechanism for partial-wetting formulated in consort with microphysical phenomena.
- Systematic study of physical effects of operating variables on module performance.
- Existence of a non-dispersive hydrodynamic regime for liquid-phase demonstrated.
- Broad analysis of temporal decline in CO_2 flux pertaining to morphological changes.

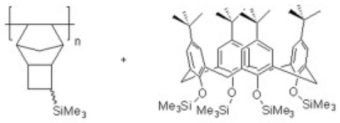
Gas-transport properties of new mixed matrix membranes based on addition poly(3-trimethylsilyltricyclononene-7) and substituted calixarenes Original Research Article

Pages 83-91

P.P. Chapala, M.V. Bermeshev, L.E. Starannikova, V.P. Shantarovich, N.N. Gavrilova, V.G. Avakyan, M.P. Filatova, Yu.P. Yampolskii, E.Sh. Finkelshtein

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Graphical abstract



Composition (wt. p/wt.p)	100/0	100/10	100/40
$\alpha(CO_2/N_2)$	13.6	14.1	20.6
$\alpha(C_4H_{10}/CH_4)$	12.9	14.3	24.6

Effect of single-walled carbon nanotubes on the transport properties of sulfonated poly(styrene–isobutylene–styrene) membranes Original Research Article

Pages 92-102

Sonia L. Avilés-Barreto, David Suleiman

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Highlights

- Transport properties are influenced by the type (bulk or bound) and amount of water.
- Selectivity results suggest an optimum SWCNT loading due to competing effects.
- SWCNT functionalized with terminal sulfonic groups improve transport properties.
- Selectivity improvements are more significant for substances of different polarities.

ZIF-8/PDMS mixed matrix membranes for propane/nitrogen mixture separation: Experimental result and permeation model validation Original Research Article

Pages 103-113

Manquan Fang, Chilung Wu, Zhengjin Yang, Tao Wang, Yang Xia, Jiding Li

Abstract | Close research highlights | Purchase PDF - $35.95

Highlights

- ZIF-8/PDMS MMMs were fabricated and applied in hydrocarbon recovery.
- Intimate interface interaction with enhanced selectivity for MMMs.
- Modified Maxwell model taking non-ideal interface and agglomeration into account.
- Extended application scope of Maxwell model with credible prediction result.

Preparation and characterization of carbon and carbon/zeolite membranes from ODPA–ODA type polyetherimide Original Research Article

Pages 114-121

Bing Zhang, Yonghong Wu, Yunhua Lu, Tonghua Wang, Xigao Jian, Jieshan Qiu

Abstract | Close research highlights | Purchase PDF - $35.95

Highlights

- ODPA–ODA type polyetherimide was developed to prepare carbon membranes.
- The effect of preoxidation temperatures on membranes was discussed.
- The gas separation data of the carbon membranes surpass Robeson's upper bound.
- The incorporation of zeolite ZSM-5 into carbon membranes improves the H_2/N_2 selectivity.

Gas sorption and transport in thermally rearranged polybenzoxazole membranes derived from polyhydroxylamides Original Research Article

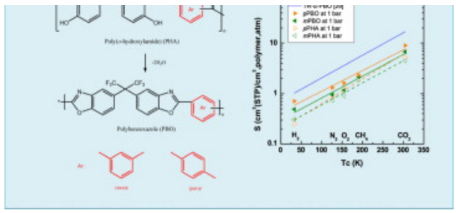
Pages 122-131

Seungju Kim, Jong Geun Seong, Yu Seong Do, Young Moo Lee

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A study on structure and properties of poly(*p*-phenylene terephthamide) hybrid porous membranes Original Research Article

Pages 132-139

Chun Wang, Changfa Xiao, Qinglin Huang, Jian Pan

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Reduction of methanol crossover and improved electrical efficiency in direct methanol fuel cell by the formation of a thin layer on Nafion 117 membrane: Effect of dip-coating of a blend of sulphonated PVdF-co-HFP and PBI Original Research Article

Pages 140-147

Sudipta Mondal, Shweta Soam, Patit Paban Kundu

Abstract | Close research highlights | Purchase PDF - $35.95

Highlights

- Coating of the blends of SPVDF-co-HFP and PBI on Nafion 117.
- Lowering of methanol crossover of Nafion 117 was found.
- Higher stability of coated membranes at higher temperature was observed.
- Maximum performance (39 mW/cm^2) at 90 °C resulted with the membrane coated with 70:30 PBI and SPVDF-co-HFP.

The functional separator coated with core–shell structured silica–poly(methyl methacrylate) sub-microspheres for lithium-ion batteries Original Research Article

Pages 148-155

Pingting Yang, Peng Zhang, Chuan Shi, Lixiao Chen, Jianhui Dai, Jinbao Zhao

Abstract | Close research highlights | Purchase PDF - $35.95

Highlights

- Core–shell structured SiO_2–poly(methyl methacrylate) sub-microspheres are prepared.
- A functional ceramic-coated separator coated by the sub-microspheres is developed.
- The separator exhibits good thermostability and electrolyte retention ability.
- The separator multi-functionality provides cells with greater safety performance.

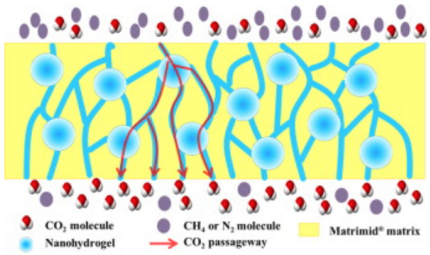
Constructing CO_2 transport passageways in Matrimid® membranes using nanohydrogels for efficient carbon capture Original Research Article

Pages 156-166

Xueqin Li, Meidi Wang, Shaofei Wang, Yifan Li, Zhongyi Jiang, Ruili Guo, Hong Wu, XingZhong Cao, Jing Yang, Baoyi Wang

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Novel composite cation exchange films based on sulfonated PVDF for electromembrane separations Original Research Article

Pages 167-174

H. Farrokhzad, T. Kikhavani, F. Monnaie, S.N. Ashrafizadeh, G. Koeckelberghs, T. Van Gerven, B. Van der Bruggen

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Highlights

- A novel composite membrane based on sulfonated PVDF was synthesized.
- Sufonation was proved by FTIR and its degree was estimated by TGA and HNMR.
- Sulfonation decreased the thermal stability and melting point of PVDF.
- IEC and conductivity were varied against the permselectivity in membranes.
- The membrane with 70% S-PVDF gave a better performance than a commercial membrane.

Alkali resistant cross-linked poly(arylene ether sulfone)s membranes containing aromatic side-chain quaternary ammonium groups Original Research Article

Pages 187-195

Guanghui Nie, Xiuhua Li, Jinxiong Tao, Wenjun Wu, Shijun Liao

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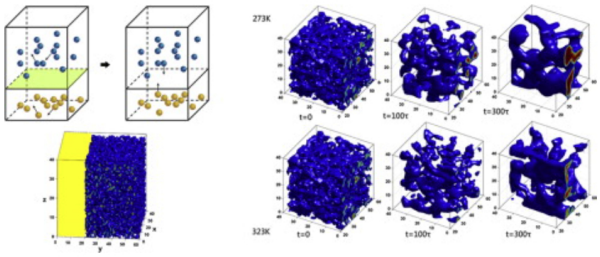
Investigation on the membrane formation process of polymer–diluent system via thermally induced phase separation accompanied with mass transfer across the interface: Dissipative particle dynamics simulation and its experimental verification Original Research Article

Pages 196-206

Yuan-hui Tang, Yan-dong He, Xiao-lin Wang

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Assessing the interaction effects of coagulation pretreatment and membrane material on UF fouling control using HPSEC combined with peak-fitting Original Research Article

Pages 207-214

Chun-Hsi Lai, Yung-Chen Chou, Hsuan-Hsien Yeh

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Highlights

- PVC based UF membrane retained only biopolymer fraction organic.
- Besides biopolymer, CA based UF membrane also retained low MW organics.
- Alum coagulation had higher removal of biopolymer than that of low MW acids.
- The efficiency of alum pre-coagulation on CA membrane fouling control was inferior to that on PVC membrane.

Numerical simulation of linear sweep and large amplitude ac voltammetries of ion-exchange membrane systems Original Research Article

Pages 215-223

A.A. Moya, E. Belashova, P. Sistat

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Highlights

- The linear sweep voltammetry of ion-exchange membranes is investigated.
- A threshold sweep rate to get currents higher than that of the limiting current is calculated.
- The waveforms for the current in ac voltammetry in membranes are analyzed.
- A threshold frequency to get current amplitudes higher than that of the limiting current is obtained.

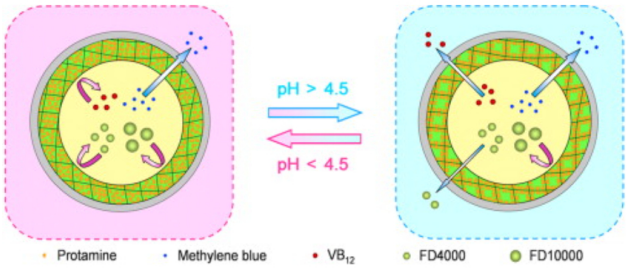
Persistently hydrophilic microporous membranes based on *in situ* cross-linking Original Research Article
Pages 224-232
Mimi Tao, Fu Liu, Lixin Xue
Abstract | Close research highlights | Purchase PDF - $35.95 | Supplementary content

Highlights

- PVP segments were firmly immobilized in the PVDF membrane due to the well-designed *in situ* cross-linking reaction.
- The obtained membrane exhibited outstanding hydrophilicity and excellent antifouling property.
- The newly-developed strategy can be extended to a universal approach to persistently hydrophilic microporous membrane.

pH-responsive controlled release characteristics of solutes with different molecular weights diffusing across membranes of Ca-alginate/protamine/silica hybrid capsules Original Research Article
Pages 233-243
Fan He, Li Mei, Xiao-Jie Ju, Rui Xie, Wei Wang, Zhuang Liu, Fang Wu, Liang-Yin Chu
Abstract | Close graphical abstract | Research highlights | Purchase PDF - $35.95

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Self-humidifying Pt–graphene/SiO_2 composite membrane for polymer electrolyte membrane fuel cell Original Research Article
Pages 254-262
D.C. Lee, H.N. Yang, S.H. Park, K.W. Park, W.J. Kim
Abstract | Close research highlights | Purchase PDF - $35.95

Highlights

- Pt–graphene is prepared by in-situ reduction of Pt precursor on graphene oxide.
- Amount of Pt–G and SiO_2 in composite membrane affects the cell performance.
- Too much inorganic filler seems to rather block proton conduction.
- SiO_2 content due to water retention ability affects open circuit voltage.

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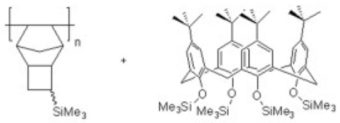
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Gas-transport properties of new mixed matrix membranes based on addition poly(3-trimethylsilyltricyclononene-7) and substituted calixarenes Original Research Article
In Press, Accepted Manuscript, *Available online 30 September 2014*
P.P. Chapala, M.V. Bermeshev, L.E. Starannikova, V.P. Shantarovich, N.N. Gavrilova, V.G. Avakyan, M.P. Filatova, Yampolskii Yu.P., E.Sh. Finkelshtein
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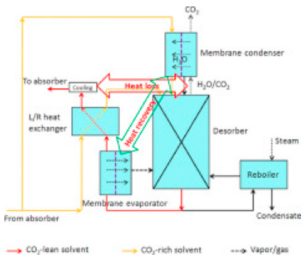
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Composition (wt. p/wt.p)	100/0	100/10	100/40
$\alpha(CO_2/N_2)$	13.6	14.1	20.6
$\alpha(C_4H_{10}/CH_4)$	12.9	14.3	24.6

Membrane evaporation of amine solution for energy saving in post-combustion carbon capture: Performance evaluation Original Research Article
In Press, Accepted Manuscript, *Available online 28 September 2014*
Shuaifei Zhao, Chencheng Cao, Leigh Wardhaugh, Paul H.M. Feron
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Mathematical Modeling of CO_2 Separation from Gaseous-Mixture using a Hollow-Fiber Membrane Module: Physical Mechanism and Influence of Partial-Wetting Original Research Article
In Press, Accepted Manuscript, *Available online 28 September 2014*
Nikhil Goyal, Shishir Suman, S.K. Gupta
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Highlights

- Comprehensive mechanistic modeling of CO_2 separation from gaseous mixture

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Comprehensive mechanistic modeling of CO_2 separation from gaseous-mixture.

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- Systematic study of physical effects of operating variables on module performance.
- Existence of a non-dispersive hydrodynamic regime for liquid-phase demonstrated.
- Broad Analysis of temporal decline in CO_2 Flux pertaining to morphological changes.

☐ Hydrogen permeability Of $SrCe_{0.7}Zr_{0.25}Ln_{0.05}O_{3-\delta}$ membranes (Ln=Tm and Yb) Original Research Article

In Press, Accepted Manuscript, *Available online 28 September 2014*

Wen Xing, Paul Inge Dahl, Lasse Valland Roaas, Marie-Laure Fontaine, Yngve Larring, Partow P. Henriksen, Rune Bredesen

Abstract | Close research highlights | Purchase PDF - $35.95

Highlights

- Zr stabilized acceptor doped $SrCeO_3$membrane materials were characterized.
- Hydrogen flux was measured under open and short circuitconditions.
- De-mixing of the materials was observed after hydrogen flux measurements.

☐ Enhanced CO_2 separation properties by incorporating poly(ethylene glycol)-containing polymeric submicrospheres into polyimide membrane Original Research Article

In Press, Accepted Manuscript, *Available online 28 September 2014*

Shaofei Wang, Zhizhang Tian, Jiangyan Feng, Hong Wu, Yifan Li, Ye Liu, Xueqin Li, Qingping Xin, Zhongyi Jiang

Abstract | Close research highlights | Purchase PDF - $35.95

Highlights

- PEG-containing submicrosphere was used as novel filler to prepare hybrid membranes.
- CO_2 solubility was increased with PEGSS incorporation.
- N_2 and CH_4 permeabilities were both decreased with PEGSS incorporation.
- CO_2/N_2 and CO_2/CH_4 selectivities were both increased in hybrid membranes.

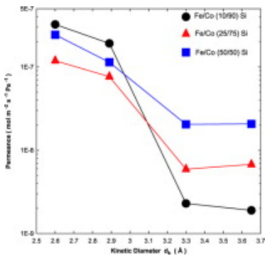
☐ Binary iron cobalt oxide silica membrane for Gas separation Original Research Article

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Adi Darmawan, Julius Motuzas, Simon Smart, Anne Julbe, João C Diniz da Costa

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☐ ZIF-8/PDMS mixed matrix membranes for propane/nitrogen mixture separation: Experimental result and permeation model validation Original Research Article

In Press, Accepted Manuscript, *Available online 28 September 2014*

Manquan Fang, Chilung Wu, Zhengjin Yang, Tao Wang, Yang Xia, Jiding Li

Abstract | Close research highlights | Purchase PDF - $35.95

Highlights

- ZIF-8/PDMS MMMs were fabricated and applied in hydrocarbon recovery.
- Intimate interface interaction with enhanced selectivity for MMMs.
- Modified Maxwell model taking non-ideal interface and agglomeration into account.
- Extended application scope of Maxwell model with credible prediction result.

☐ Synthesis and properties of highly branched star-shaped sulfonated block poly(arylene ether)s as proton exchange membranes Original Research Article

In Press, Accepted Manuscript, *Available online 28 September 2014*

Huixiong Xie, Dan Tao, Xiongzhi Xiang, Yangxing Ou, Xiaojun Bai, Lei Wang

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Highlights

- Two types of highly branched star-shaped sulfonated block polymers were synthesized.
- The star-shaped block polymers exhibit better properties than the random polymer.
- The membranes exhibit considerable proton conductivity and oxidative stability.
- The microstructure of the membranes was investigated by SEM and AFM.

Preparation, characterization and performance study of cellulose acetate membranes modified by aliphatic hyperbranched polyester Original Research Article

In Press, Accepted Manuscript, Available online 28 September 2014

Hossein Mahdavi, Taieb Shahalizade

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Highlights

- Blend membranes of CA and HBPEs with different compositions were prepared through a typical phase inversion method.
- Since additive structure and content are key parameters that determining the CA overall properties we emphasized on effect of these parameters on surface and bulk morphologies, filtration properties, wettability, thermal behaviour and hydrophilicity.
- Increasing of HBPE will cause controlled increase of pure water flux and MWCO of the CA membrane.
- SEM images and porosity determination results demonstrated that the CA-HBPEs possess dense bulk structures compared with membranes modified with conventional additives.
- Hyperbranched polyesters mostly improved surface properties of CA membranes and almost maintained bulk thermal and mechanical stability by forming inter-chain H-bond interactions.

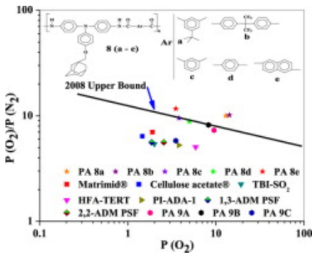
Highly gas permeable aromatic polyamides containing adamantane substituted triphenylamine Original Research Article

In Press, Accepted Manuscript, Available online 28 September 2014

Debaditya Bera, Parthasarathi Bandyopadhyay, Sipra Ghosh, Susanta Banerjee, Venkat Padmanabhan

Abstract | Close graphical abstract | Research highlights | Purchase PDF - $35.95 | Supplementary content

Graphical abstract



Structural optimization of membrane-based biogas upgrading processes Original Research Article

In Press, Accepted Manuscript, Available online 28 September 2014

Marco Scholz, Michael Alders, Theresa Lohaus, Matthias Wessling

Abstract | Close research highlights | Purchase PDF - $35.95

Highlights

- Process optimization model for gas permeation.
- New biogas upgrading process.
- Identifying optimal membrane materials.

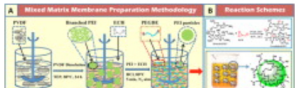
A one-pot method for the preparation of mixed matrix polyvinylidene fluoride Membranes with *in situ* synthesized and PEGylated polyethyleneimine particles Original Research Article

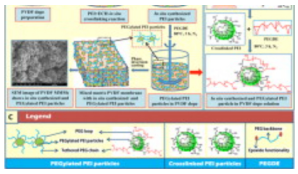
In Press, Accepted Manuscript, Available online 28 September 2014

Madhusudhana Rao Kotte, Taewoon Hwang, Jong-In Han, Mamadou S Diallo

Abstract | Close graphical abstract | Research highlights | Purchase PDF - $35.95 | Supplementary content

Graphical abstract





Application of Fe(II)/K_2MnO_4 as a pre-treatment for controlling UF membrane fouling in drinking water treatment Original Research Article

In Press, Accepted Manuscript, *Available online 28 September 2014*

Wenzheng Yu, Nigel. J.D. Graham

Abstract | Close research highlights | Purchase PDF - $35.95 | Supplementary content

Highlight

- Combination of Fe(II) and K_2MnO_4 is a potentially more cost-effective pre-treatment.
- Fe/Mn pre-treatment reduced bacterial activity and decreased EPS concentration.
- EEM confirmed protein-like materials in CUF-Fe cake layer was from bacterial growth.
- Less organic matter was adsorbed in the pores of CUF-Fe/Mn membrane than CUF-Fe.

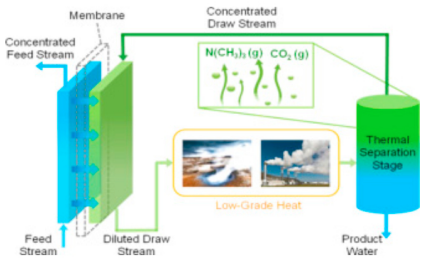
Performance Evaluation of trimethylamine – carbon dioxide thermolytic draw solution for engineered osmosis Original Research Article

In Press, Accepted Manuscript, *Available online 22 September 2014*

Chanhee Boo, Yehia Khalil, Menachem Elimelech

Abstract | Close graphical abstract | Research highlights | Purchase PDF - $35.95

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Transport Properties of electrospun fibrous Membranes with controlled anisotropy Original Research Article

In Press, Accepted Manuscript, *Available online 22 September 2014*

Matthew D.R. Kok, Jeff T. Gostick

Abstract | Close research highlights | Purchase PDF - $35.95

Highlights

- Membranes with varying degrees of fiber alignment were electrospun.
- In-plane permeability was measured with and against fiber direction.
- The results are normalized for varying fiber size, porosity, alignment and thickness.
- A method is proposed to extract meaningful Carman-Kozeny constants from the data.

Evaluation of electrochemical Properties and reverse electrodialysis performance for porous cation exchange Membranes with sulfate-functionalized iron oxide Original Research Article

In Press, Accepted Manuscript, *Available online 21 September 2014*

Jin Gi Hong, Yongsheng Chen

Abstract | Close research highlights | Purchase PDF - $35.95

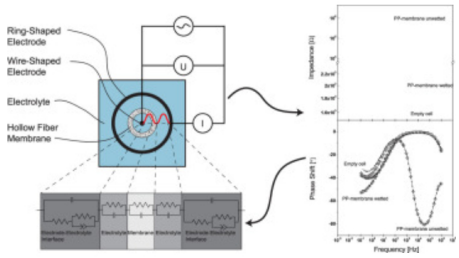
Highlights

- Synthesis and application of porous nanocomposite cation exchange membranes for RED power generation.
- Structural variation and nanoparticle loadings significantly enhanced the electrochemical properties.
- Area resistance was highly dependent on thickness and porosity of the membranes.
- Reduction of membrane thickness improved 45% of gross power density.

Characterization of hollow fiber membranes by impedance spectroscopy Original Research Article

In Press, Accepted Manuscript, *Available online 19 September 2014*
S. Bannwarth, M. Darestani, H. Coster, M. Wessling
Abstract | Close graphical abstract | Research highlights | Purchase PDF - $35.95

Graphical abstract



Influence of Propane on CO_2/CH_4 and N_2/CH_4 Separations in CHA Zeolite Membranes Original Research Article
In Press, Accepted Manuscript, *Available online 19 September 2014*
Ting Wu, Merritt C. Diaz, Yihong Zheng, Rongfei Zhou, Hans H. Funke, John L. Falconer, Richard D. Noble
Abstract | Close research highlights | Purchase PDF - $35.95

Highlights

- SSZ-13 membranes can be prepared with very few defects.
- Propane decreases CO_2, N_2, and CH_4 permeances through SAPO-34 and SSZ-13 membranes.
- Propane affects SSZ-13 membranes less than SAPO-34 membranes.
- SSZ-13 membranes separate N_2/CH_4 mixtures with selectivities of 9–13.

Recent Advances in membrane distillation processes: membrane development, configuration design and application Exploring Review Article
In Press, Accepted Manuscript, *Available online 19 September 2014*
Peng Wang, Tai-Shung Chung
Abstract | Close research highlights | Purchase PDF - $35.95

Highlights

- This review aims to summarize the recent advances in membrane distillation (MD) and provide perspectives for its future R&D.
- The development of MD membranes was reviewed from different aspects as material, micro-structure and macro-geometry.
- The traditional and new configuration designs with improved energy efficiency were summarized.
- Various applications and MD based hybrid systems were reviewed comprehensively.

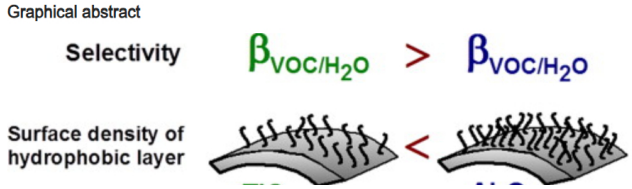
Anionic catalyst binders based on trimethylamine-quaternized poly(2,6-dimethyl-1,4-phenylene oxide) for alkaline electrolyzers Original Research Article
In Press, Accepted Manuscript, *Available online 17 September 2014*
Jan Schauer, Jaromír Hnát, Libžovauše Brožová, Jan Žitka, Karel Bouzek
Abstract | Close research highlights | Purchase PDF - $35.95

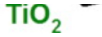
Highlights

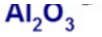
- Trimethylamine-quaternized poly(2,6-dimethyl-1,4-phenylene oxide) (qPPO) was prepared.
- qPPO was tested as a catalyst binder in an alkaline membrane electrolyzer.
- The application of qPPO lead to higher current densities than that of PTFE binder.

Removal of hazardous volatile organic compounds from water by vacuum pervaporation with Hydrophobic ceramic membranes Original Research Article
In Press, Accepted Manuscript, *Available online 16 September 2014*
Joanna Kujawa, Sophie Cerneaux, Wojciech Kujawski
Abstract | Close graphical abstract | Research highlights | Purchase PDF - $35.95

Graphical abstract







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