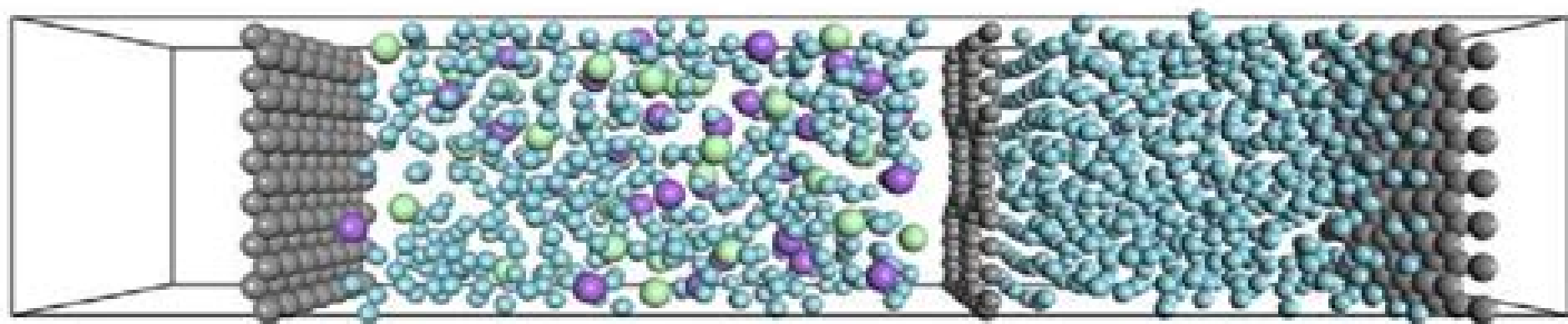
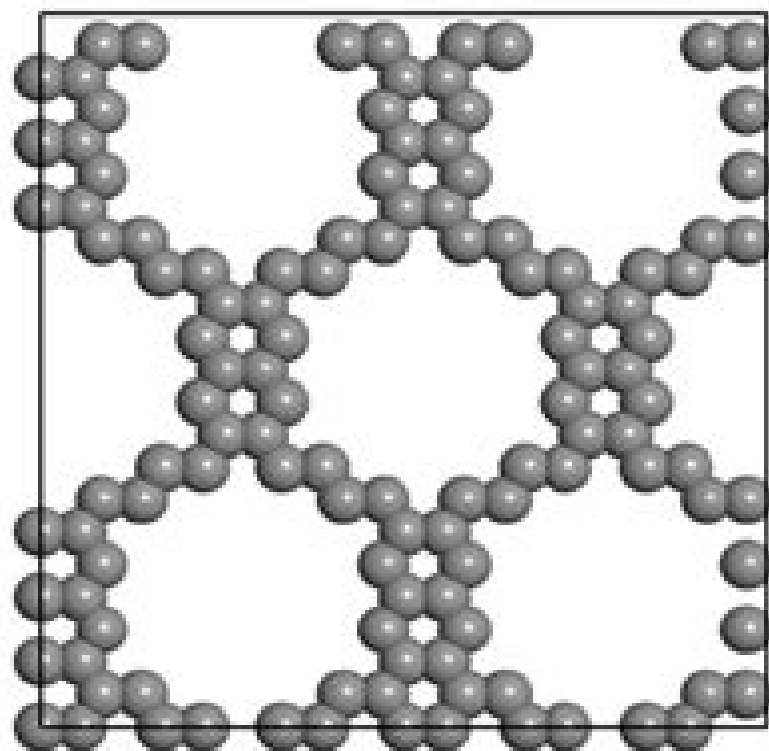




(a)



(b)

Solute And Solvent Transport Through Nanoporous Ceramic Membranes

Kang Li



Solute And Solvent Transport Through Nanoporous Ceramic Membranes:

Solute and Solvent Transport Through Nanoporous Ceramic Membranes Thomas Hilfer, 2011 Science and Technology of Separation Membranes Tadashi Uragami, 2017-02-10 Offers a comprehensive overview of membrane science and technology from a single source Written by a renowned author with more than 40 years experience in membrane science and technology and polymer science Covers all major current applications of membrane technology in two definitive volumes Includes academic analyses applications and practical problems for each existing membrane technology Includes novel applications such as membrane reactors hybrid systems and optical resolution as well as membrane fuel cells **Advanced Materials for Membrane Preparation** Maria Giovanna Buonomenna, G. Golemme, 2012 The need to reduce pollution and the waste of energy and resources imposes a wider diffusion of environmentally friendly membrane systems The expanding domain of membrane operations demands tailored materials with unprecedented performances and resistance Ceramic Materials Research Trends Paul B. Lin, 2007 Ceramics are refractory inorganic and non metallic materials They can be divided into two classes traditional and advanced Traditional ceramics include clay products silicate glass and cement while advanced ceramics consist of carbides SiC pure oxides Al₂O₃ nitrides Si₃N₄ non silicate glasses and many others Ceramics offer many advantages compared to other materials They are harder and stiffer than steel more heat and corrosion resistant than metals or polymers less dense than most metals and their alloys and their raw materials are both plentiful and inexpensive Ceramic materials display a wide range of properties which facilitate their use in many different product areas This book presents new and important international research in this dynamic field **Comprehensive Membrane Science and Engineering** Enrico Drioli, Lidietta Giorno, Enrica Fontananova, 2017-07-20 Comprehensive Membrane Science and Engineering Second Edition Four Volume Set is an interdisciplinary and innovative reference work on membrane science and technology Written by leading researchers and industry professionals from a range of backgrounds chapters elaborate on recent and future developments in the field of membrane science and explore how the field has advanced since the previous edition published in 2010 Chapters are written by academics and practitioners across a variety of fields including chemistry chemical engineering material science physics biology and food science Each volume covers a wide spectrum of applications and advanced technologies such as new membrane materials e g thermally rearranged polymers polymers of intrinsic microporosity and new hydrophobic fluoropolymer and processes e g reverse electrodialysis membrane contractors membrane crystallization membrane condenser membrane dryers and membrane emulsifiers that have only recently proved their full potential for industrial application This work covers the latest advances in membrane science linking fundamental research with real life practical applications using specially selected case studies of medium and large scale membrane operations to demonstrate successes and failures with a look to future developments in the field Contains comprehensive cutting edge coverage helping readers understand the latest theory Offers readers a variety of perspectives on how

membrane science and engineering research can be best applied in practice across a range of industries Provides the theory behind the limits advantages future developments and failure expectations of local membrane operations in emerging countries

Porous Membranes Annarosa Gugliuzza,Wanqin Jin,2025-08-04 The book is essential for anyone seeking a deep understanding of porous membranes as it offers valuable insights into manufacturing methods innovative applications and strategies for optimizing membrane design to meet critical project demands across various fields Porous Membranes Breakthroughs in Manufacturing and Applications is a comprehensive guide to discovering the world of porous membranes and their applications This volume gives a global perspective of basic concepts featuring manufacturing approaches and potential applications where control of pore size and shape and distribution can be decisive for the success of a membrane process In depth explanations elaborate on the key role assigned to a membrane s pores in directing events that are crucial for the mandatory targets imposed by a project s requirements Further discussions on how to manage and characterize materials from a molecular to macro scale to achieve highly defined architecture to enable high performing separations are explored Advances and innovation are central themes providing useful solutions to current critical aspects and existing bottlenecks in the control of structural and chemical features of targeted membranes This cross disciplinary discussion opens new routes for membrane science in expanding fields including water management environmental remediation recovery of targeted compounds food and health Readers will find this book Introduces the strict relationship between extensively ordered porous membranes and enhanced productivity Explores new approaches based on new membrane pore concepts Emphasizes the feasibility and reliability of the proposed techniques within the context of a potential scale up analyzing critical issues and traits Focuses on the role of porous membranes in some strategic membrane operations providing clear evidence about the fundamental role of structure separation properties for the success of membrane processes dedicated to natural resource management Audience Researchers in chemistry biology biomedicine materials science textiles and electronics who are involved with membranes and materials technologists and product managers from industry including those responsible for research and development building prototypes and commercial devices will find this book to be especially valuable

Chemical Abstracts ,2002 **Applied Science & Technology Index** ,2000

Organically-modified Ceramic Membranes for Solvent Nanofiltration Cheryl Raditya Tanardi,2015 Ceramic Membranes Applied in Separation Processes Dionisio da Silva Biron,Venina dos Santos,Mara Zeni,2017-05-18 This book covers diverse types of ceramic membranes applied in separation processes The authors present the preparation methods and well as the main application of ceramic membranes Modules microfiltration and ultrafiltration are topics described within the text The final chapter focuses on water and wastewater treatment by membranes separation processes

Organic Solvent Nanofiltration in the Peptide Industry Patrizia Marchetti,2013 In recent years the application of membrane technology to molecular separation processes has stimulated interest and showed great potential in a number of

industrial fields Ultrafiltration membranes have been successfully applied to downstream separation of therapeutically active peptides to overcome some of the limitations of the conventional techniques in terms of costs scale up selectivity and solvent recovery In this research project Organic Solvent Nanofiltration of peptide solutions is studied and this understanding is applied to the development of innovative membrane based purification strategies for industrial case studies Basic understanding of transport mechanisms was approached by investigating solvent transport through ceramic nano and ultrafiltration membranes and developing a predictive phenomenological model for the transport of solvents and solvent mixtures Effects of solvent membrane interactions strongly affected the solvent permeation through nanofiltration membranes while they were found to be negligible in the ultrafiltration range The effect of the organic solvent on the permeation of neutral and charged solutes monovalent salts a small molecule and peptides in organic water mixtures was studied with particular attention to the role of preferential solvation in the solvent mixture It was found that the solvent composition and the complex association of counter ions and buffers highly affect membrane permeation and rejection of organic molecules It is proposed that all these components change the relative solute membrane affinity Since permeation of peptides in organic water mixtures is affected by complicated matrices of input parameters a Design of Experiment approach was proposed to efficiently investigate the nanofiltration of model peptides in acetonitrile water solutions Statistical models for solvent flux peptide and ion rejection were obtained by Analysis of Variance and interpreted from a phenomenological point of view The statistical models were used to assist process development for two industrial case studies 1 concentration and salt solvent exchange of a first therapeutic peptide were optimised based on the integration of the statistical DoE models with the process simulation for concentration and diafiltration 2 the nanofiltration assisted synthesis of a second therapeutic peptide based on the coupling between nanofiltration and reaction in one unique process was developed and compared to the established process by techno economical analysis The so called Reactive Peptide Nanofiltration was found to be advantageous in terms of economics efficacy impact on the market and on the environment In conclusion nanofiltration was found to be a solid and competitive technique for application to peptide processes On the basis of the results of this research Lonza decided to invest in a new nanofiltration plant for the downstream of peptides with ceramic membranes The advantages of nanofiltration technology in terms of development of more efficient materials stable in critical solvents and harsh acid basic conditions improvement of membrane performances selectivity lifetime and integration of nanofiltration with other techniques in hybrid processes seem therefore promising in overcoming the hesitancy of industries to modify the established processes and invest in new nanofiltration plants by making the payback period for the return of investment more attractive It is plausible to think that this technology will shortly become a primary choice for new separation and purification processes

Ceramic Membranes for Liquid Phase Separations Reid Alan Peterson, 1994 **Ionic and Molecular Transport Through Active Nanoporous Membranes** Fabien Wildhaber, Philippe Renaud (Physiker, Schweiz), 2014

Size-selective Transport of Uncharged Solutes Through Multilayer Polyelectrolyte Membranes Xiaoyun

Liu,2003 Study of the Separation by Organic Solvent Nanofiltration of Diluted Solutes Using Commercial, Dense and Porous Membranes and Their Derivatives by Deposition of Polyelectrolyte Nanolayers Mahbub Morshed,2019 The objective of this study was to improve the OSN separation performance of commercial membranes for metathesis applications in which highly diluted catalysts are used In this work commercial polymeric membranes were first studied to characterize their performance in organic media using very dilute solute solvent binary mixtures Based on a literature review it was shown that the PERVAP4060 membrane of which PDMS is the dense active layer was a promising candidate for organic solvent nanofiltration OSN As a porous membrane the AMS and PAN commercial supports have also been taken into account In this study we considered the modification on the surface to improve the separation properties of polymeric OSN membranes Ar O₂ plasma and or polyelectrolytes multilayers were used for the preparation of new prototype membranes Unmodified and modified membranes were tested under OSN conditions using binary feed mixtures Several highly dilute solutes organophosphorus ligand R BINAP phase transfer catalyst ToABR and linear alkanes have been studied Both R BINAP and ToABR were used in the range of 0.0001 to 0.5% by weight and most experiments were subsequently performed with 0.05% solute concentrations in toluene It has been shown that PDMS can retain 80% R BINAP and about 93% ToABr in toluene After modification by the LBL deposition the rejection is improved with the modified PERVAP4060 membranes leading to an 88% rejection of R BINAP with a deposit of 10 PAH PSS polyelectrolyte bilayers at the surface and this rejection being able to reach 95% when the number of bilayers is 20 ToABr rejection increases to 97% with the ten bilayered membranes The performance of the membrane was studied under different pressures of between 1 and 40 bar the high rejection still observed in these OSN conditions strongly supports a solution diffusion transfer mechanism through the PDMS The treatment of ternary mixtures mimicking the catalyst solute solvent mixture corresponding to the hydroformylation has also been studied no evidence of coupling was detected and the highest retention remained unchanged On the other hand the improvement of the rejection also observed from the porous membranes after modification The rejection of C₄₄ in the AMS was reached 75% after modification by 10 bilayers of PDDA PSS whereas it was only 25% before modification In the modified PAN the rejection of the solutes obtained is in the range of 37 to 50% whereas it was only 3 to 7% by weight before modification The disadvantage of the porous membrane however is the sharp decrease in flux after the deposition of the multiple layers

Ceramic Membranes for Separation and Reaction Kang Li,2007-04-30 Ceramic Membranes for Reaction and Separation is the first single authored guide to the developing area of ceramic membranes Starting by documenting established procedures of ceramic membrane preparation and characterization this title then focuses on gas separation The final chapter covers ceramic membrane reactors as distributors and separators and general engineering considerations Chapters include key examples to illustrate membrane synthesis characterisation and applications in industry

Theoretical principles advantages and disadvantages of using ceramic membranes under the various conditions are discussed where applicable Recent Advances in Gas Separation by Microporous Ceramic Membranes N.K.

Kanellopoulos,2000-09-26 This book is dedicated to the rapidly growing field of microporous ceramic membranes with separating layers of pore diameter less than 2nm The chapters of this book bring forward a wide range of issues namely fundamentals of complex sorption and transport processes in micropore structures highly innovative methods of preparation of microporous membranes and examples of their possible commercial applications This book presents insights by distinguished investigators who have contributed significantly to the advance of research efforts in the diverse topics described herein Recently significant progress has been made with respect to the development of novel microporous asymmetric membranes mainly involving modification by means of deposition of additional material within the pores of the substrates Most state of the art technologies aiming in the development of microporous ceramic membrane are presented in the third section of the book These include several material deposition methods and techniques on macroporous or mesoporous supports and substrates from the liquid or vapour phase namely those involving sol gel zeolite and chemical vapour deposition techniques In addition to the above mentioned methods the classical technique of carbonizing polymeric deposits along with one of the novel techniques of plasma treating organically deposited Langmuir Blodgett films are also presented Nanophase mixed ionic electron membranes for enhanced oxygen transport are described which pose a strong candidacy for a number of significant commercial applications Solvent Transport Through Nanofiltration Membranes

Dario R. Machado,Ṭekhniyon, Makhon ṭekhnologi le-Yiśra'el. Fakultah le-handasah khimit,1998 **The Influence of Temperature on Ion Transport in Nanofiltration Membranes** Yagnaseni Roy,2018 Nanofiltration NF is a pressure driven membrane based solution treatment technology similar to reverse osmosis RO The niche set of applications for NF includes those requiring selectivity between monovalent ions and multivalent ions Incoming streams to be treated can occur over a wide range of temperature usually between 20 100 C The advantage of operating NF at higher temperatures is increased water recovery while the key drawback is diminished salt retention Although the change of these performance metrics is widely reported in literature few sources explain the causative mechanisms Temperature variation of the mobilities of both solute and solvent species the solute diffusivity and solvent viscosity are well studied and are used to explain changes in transport through the membrane in most literature However NF membranes are defined by several structural and charge based properties which are likely to be affected by temperature This thesis elucidates the effect of individual membrane properties and mobilities on NF permeate quality and finally compares sets of parameters on the extent to which they explain the change in NF selectivity with temperature change Modeling results show that neither membrane parameter changes nor mobilities can alone explain selectivity changes with temperature With increasing pressure however the net effect of membrane parameters increasingly overshadows that of the mobilities As mentioned previously NF is used particularly for

monovalent multivalent ion separations The study of fractionation involving separation of sodium chloride from sodium sulfate is one such application and is often conducted between 20 50 C Previous studies do not indicate whether selectivity between the charged species improves or deteriorates at higher temperature In this thesis a selectivity metric M is introduced and an analytical framework is established to explain its variation with temperature variation as well as other membrane and operating parameters The conclusion is that selectivity decreases at higher temperature which can be mitigated by design focus on enhanced charge acquirement by the membrane at elevated temperature The final segment of this work introduces a common modeling framework for pressure driven NF and RO and osmotically driven membrane processes forward osmosis FO to identify both similarities and dissimilarities in salt transport mechanisms RO and FO membranes are traditionally considered non porous membranes while NF membranes are known to possess nanometer sized pores However experimental and spectroscopy results in the past decade report detection of pores in RO and FO membranes The modeling results in this thesis show that all three membranes can be modeled as porous the key distinction being that the pressurized modes allow salt water transport coupling

A Study of Solvent and Macrosolute Transport Mechanisms in Asymmetric Ultrafiltration Membranes Alan S. Michaels, 1981

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