

REFERENCES

- Agag, T., and Takeichi, T. (2000) Polybenzoxazine–montmorillonite hybrid nanocomposites: synthesis and characterization. Polymer, 41, 7083-7090.
- Agag, T., and Takeichi, T. (2006) High–molecular–weight AB–type benzoxazines as new precursors for high–performance thermosets. Journal of Polymer Science: Part A: Polymer Chemistry, 45, 1878-1888.
- Anson, M., Marchese, J., Garis, E., Ochoa, N., and Pagliero, C. (2004) ABS copolymer-activated carbon mixed matrix membranes for CO₂/CH₄ separation. Journal of Membrane Science, 243, 19-28.
- Calò, E., Maffezzoli, A., Mele, G., Martina, F., Mazzetto, S.E., Tarzia, A., Stifani, C. (2007) Synthesis of a novel carbonol–based benzoxazine monomer and environmentally sustainable production of polymers and bio–composites. Green Chemistry, 9, 754-759.
- Chaisuwan, T., and Ishida, H. (2006) High-performance maleimide and nitrile-functionalized benzoxazines with good processibility for advanced composites applications. Journal of Applied Polymer Science, 101, 548-558.
- Charoenpol, J. (2002) Mixed matrix membranes for CO₂/N₂ separation. M.S. Thesis, The Petroleum and Petrochemical College.
- Cheng, Y., Li, J.S., Wang, L.J., Sun, X.Y., and Liu, X.D. (2006) Synthesis and characterization of Ce–ZSM–5 zeolite membranes. Separation and Purification Technology, 51, 210-218.
- Corma, A. (1995) Inorganic solid acids and their use in acid-catalyzed hydrocarbon reactions. Chem, 95, 559-614.
- Duval, J.M., Folkers, B., Mulder, M.H.V., Desgrandchamps, G., and Smolders, C.A. (1993) Adsorbent filled membranes for gas separation. Part 1. Improvement of the gas separation properties of polymeric membranes by incorporation of microporous adsorbents. Journal of Membrane Science, 80, 189.
- Hamad, F., Khulbe, K.C., and Matsuura, T. (2001) Study on the interaction of methane gas with poly(phenylene oxide) membrane using infrared spectroscopic method. Journal of Membrane Science, 186, 281-284.

- Hennepe, H.Te., Bargeman, D., Mulder, M.H.V., and Smolders, C.A. (1987) Zeolite-filled silicone rubber membranes: Part 1. Membrane preparation and pervaporation results. Journal of Membrane Science, 35, 39-55.
- Ishida, H., and Sanders, D.P. (2000) Regioselectivity and network structure of difunctional alkyl-substituted aromatic amine-based polybenzoxazines. Macromolecules, 33, 8149.
- Ishida, H., and Ohba, S. (2005) Synthesis and characterization of maleimide and norbornene functionalized benzoxazines. Polymer, 46, 5588.
- Ismail, A.F., and Lorna, W. (2002) Penetrant-induced plasticization phenomenon in glassy polymers for separation membrane. Separation and Purification Technology, 27, 173-194.
- Jia, M., Peinemann, K.V., and Behling, R.D. (1991) Molecular sieving effect of the zeolite-filled silicone rubber membranes in gas permeation. Journal of Membrane Science, 133, 231.
- Kim, H., Brunovska, Z., and Ishida H. (1999) Molecular characterization of the polymerization of acetylene-functional benzoxazine resins. Polymer, 40, 1815-1822.
- Kim, J.H., Ha, S.Y., Nam, S.Y., Rhim, J.W., Baek, K.H., and Lee, Y.M. (2001) Selective permeation of CO₂ through pore-filled polyacrylonitrile membrane with poly(ethylene glycol). Journal of Membrane Science, 186, 97-107.
- Kiskan, B., Colak, D., Muftuoglu, A.E., Cianga, I., and Yagci, Y. (2005) Synthesis and characterization of thermally curable benzoxazine-functionalized polystyrene macromonomers. Macromolecular Rapid Communications, 26, 819-824.
- Kiskan, B., Yagci, Y., and Ishida, H. (2008) Synthesis, characterization, and properties of new thermally curable polyetheresters containing benzoxazine moieties in the main chain. Journal of Polymer Science: Part A: Polymer Chemistry, 46, 414-420.
- Koros, W.J., et al. (2002) Challenges in forming successful mixed matrix membranes with rigid polymeric. Journal of Applied Polymer Science, 86, 881-890.
- Koros, W.J., and Mahajan, R. (2002) Mixed matrix materials with glassy polymer. Part 1. Polymer Engineering and Science, 42(7), 1420-1431.

- Koros, W.J., and Mahajan, R. (2002) Mixed matrix membrane materials with glassy polymer. Part 2. Polymer Engineering and Science, 42(7), 1432-1441.
- Krishna, R., and Baten, J.Van. (2007) Using molecular simulations for screening of zeolites for separation of CO₂/CH₄ mixtures. Chemical Engineering Journal, 133, 121-131.
- Li, J., Wang, S., Nagai, K., Nakagawa, T., and Mau, A.W. (1998) Effect of polyethyleneglycol (PEG) on gas permeabilities and permselectivities in its cellulose acetate (CA) blend membranes. Journal of Membrane Science, 138, 143-152.
- Li, Y., and Chung, T.S. (2007) Novel Ag⁺-zeolite/polymer mixed matrix membranes with a high CO₂/CH₄ selectivity. AIChE. Journal, 53(3), 610-616.
- Li, Y., and Guan, H.M., Chung, T.S., and Kulprathipanja, S. (2006) Effect of novel silane modification of zeolite surface on polymer chain rigidification and partial pore blockage in polyethersulfone (PES)-zeolite A mixed matrix membranes. Journal of Membrane Science, 275, 17-28.
- Liu, Y.L., Hillock, A.W., Husain, S., Koros, W., and Kulprathipanja, S. (2004) Review of Recent Progress in Mixed Matrix Membranes.
- Liu, Y.L., Yu, J.M., and Chou, C.I. (2004) Preparation and properties of novel benzoxazine and polybenzoxazine with maleimide groups. Journal of Polymer Science, 42, 5954-5963.
- Lomratsiri, J., Probst, M., and Limtrakul, J. (2006) Structure and adsorption of a basic probe molecule on H-ZSM-5 nanostructured zeolite: An embedded ONIOM study. Journal of Molecular Graphics and Modelling, 25, 219-225.
- Low, H.Y., and Ishida, H. (1999) Structural effects of phenols on the thermal and thermo-oxidative degradation of polybenzoxazines. Polymer, 4365-4376.
- Men, W., and Lu, Z. (2007) Synthesis and characterization of 4,4'-diaminodiphenyl methane-based benzoxazines and their polymers. Journal of Applied Polymer Science, 106, 2769-2774.
- Mohamed, R.M., Aly, H.M., El-Shahat, M.F., Ibrahim, I.A. (2005) Effect of the silica sources on the crystallinity of nanosized ZSM-5 zeolite. Microporous and Mesoporous Materials, 79, 7-12.

- Mulder, M. (1997) *Basic Principles of Membrane Technology*, second ed. Kluwer Academic Publishers, Dordrecht.
- Pechar, T.W., Kim, S., Vaughan, B., Marand, E., Baranauskas, V., Riffle, J., Jeong, H.K., Tsapatsis, M. (2006) Preparation and characterization of a poly(imide siloxane) and zeolite L mixed matrix membrane. Journal of Membrane Science, 277, 210-218.
- Singha-in, P. (2008) Mixed matrix membranes for gas separation. M.S. Thesis, The Petroleum and Petrochemical College.
- Şen, D., Kalıpçılar, H., and Yilmaz, L. (2007) Development of polycarbonate based zeolite 4A filled mixed matrix gas separation membranes. Journal of Membrane Science, 303, 194-203.
- Su, Y.C., and Chang, F.C. (2003) Synthesis and characterization of fluorinated polybenzoxazine material with low dielectric constant. Polymer, 44, 7989.
- Süer, M.G., Bac, N., and Yilmaz, L. (1994) Gas permeation characteristics of polymer-zeolite mixed matrix membranes. Journal of Membrane Science, 91, 77.
- Takeichi, T., Kano, T., and Agag, T. (2005) Synthesis and thermal cure of high molecular weight polybenzoxazine precursors and the properties of the thermosets. Polymer, 46, 12172-12180.
- Thomas, S., Pinnau, I., and Guiver, M.D. (2009) Pure- and mixed-gas permeation properties of a microporous spirobisindane-based ladder polymer (PIM-1). Journal of Membrane Science, 333, 125-131.
- Vu, D.Q., Koros, W., and Miller, S.J. (2003) Mixed matrix membranes using carbon molecular sieves I. preparation and experimental results. Journal of Membrane Science, 211, 311-334.
- Wang, Y.X., and Ishida, H. (2000) Synthesis and properties of new thermoplastic polymers from substituted 3,4-Dihydro-2H-1,3-benzoxazines. Macromolecules, 33, 2839.
- Wijmans, J.G., and Baker, R.W. (1995) The solution-diffusion model: a review. Journal of Membrane Science, 107, 1-21.

Yong, H.H., Park, H.C., Kang, Y.S., Won, J., and Kim, W.N. (2001) Zeolite-filled polyimide membrane containing 2,4,6-triaminopyrimidine. Journal of Membrane Science, 188, 151-163.

Zimmerman, C.M., Singh, A., and Koros, W.J. (1997) Tailoring mixed matrix composite membranes for gas separations. Journal of Membrane Science, 137, 145-154.

“ZSM-5.” Wikipedia, the free encyclopedia. 24 May 2009.

< <http://en.wikipedia.org/wiki/ZSM-5> >

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2. Ployangoonsri, N.; Pakkethati, K.; Wongkasemjit, S.; and Chaisuwan, T. (2010, April 22) Hybrid Composite Membrane for CO₂/CH₄ Separation. Proceedings of the 16th PPC Symposium Petroleum, Petrochemicals, and Polymers, Bangkok, Thailand.

Presentations:

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2. Ployangoonsri, N.; Pakkethati, K.; Wongkasemjit, S.; and Chaisuwan, T. (2010, April 22) Hybrid Composite Membrane for CO₂/CH₄ Separation. Paper presented at the 16th PPC Symposium Petroleum, Petrochemicals, and Polymers, Bangkok, Thailand.

