



## REFERENCES

- Adsorption. <[www.answers.com/topic/adsorption](http://www.answers.com/topic/adsorption)>. Accessed on 5 May 2011.
- Adsorption. <[en.wikipedia.org/wiki/Adsorption](http://en.wikipedia.org/wiki/Adsorption)>. Accessed on 5 May 2011.
- Armenante, P.M. (2011). <[cpe.njit.edu/dlnotes/CHE685/CIs11-1.pdf](http://cpe.njit.edu/dlnotes/CHE685/CIs11-1.pdf)>. Accessed on 5 May 2011.
- Ash, G., Barth, K., Hotier, G., Mank, L., and Renard, P. (1994). Eluxyl: a new paraxylene separation process. Rev IFP, 49(5), 541-549.
- Barthomeuf, D. and Mallmann, A. (1990). Adsorption of aromatics in NaY and A1P04-5 correlation with the sorbent properties in separations. Industrial & Engineering Chemistry Research, 29, 1435-1438.
- Bellat, J.P., Pilverdierr, E., Simonot-Grange, M.H., and Julian, S. (1997). Microporous volume and external surface of Y zeolite accessible to *p*-xylene and *m*-xylene. Microporous Materials, 9, 213-220.
- Broughton, D.B., Neuzil, R.W., Pharis, J.M., and Brearley, C.S. (1970). The parex process for recovering paraxylene. Chem Eng Prog, 66(9), 70-75.
- Buarque, H.L.B., Chiavone-Filho, O., and Cavalcante Jr., C.L. (2005). Adsorption equilibria of C<sub>8</sub> aromatic liquid mixtures on Y zeolites using headspace chromatography. Separation Science and Technology, 40(9), 1817-1834.
- Guo, G.Q., Chen, H., and Long, Y.C. (2000). Separation of *p*-xylene from C<sub>8</sub> aromatics on binder-free hydrophobic adsorbent of MFI zeolite. I. studies on static equilibrium. Microporous and Mesoporous Materials, 39, 149-161.
- Harger, R.N., Bridwell, E.G., Raney, B.B. (1939). An aerometric method for the rapid determination of alcohol in water and body fluids. Proceedings, American Society of Biological Chemists., 128, Xxxviii.
- Headspace GC. <<http://www.labhut.com/education/headspace/index.php>>. Accessed on 9 May 2011.
- Hulme, R., Ronald, E., Weig, R., and Ruthven, D.M. (1991). Binary and ternary equilibria for C<sub>8</sub> aromatics on K-Y faujasite. Industrial & Engineering Chemistry Research, 30, 752-760.
- Kolb, B. (1999). Headspace sampling with capillary columns. Journal of Chromatography A, 842, 163-205.

- Kott, L. and Chen, H.M., (2010). Experimental considerations in headspace gas chromatography. Pharmaceutical Technology, 34(5), 76-79.
- Kulprathipanja, S. (2010). Zeolites in Industrial Separation and Catalysis. Wiley-VCH Verlag GmbH & Co. KGaA, Weinheim.
- Lachet, V., Buttefey, S., Boutin, A., and Fuchs, A.H. (2001). Molecular simulation of adsorption equilibria of xylene isomer mixtures in faujasite zeolites. A study of the cation exchange effect on adsorption selectivity. Physical Chemistry Chemical Physics, 3, 80-86.
- Limsamutchaikul, S. (2003). C<sub>8</sub> Aromatics Adsorption: Effect of Zeolite Acidity. M.S. Thesis in Petrochemical Technology, The Petroleum and Petrochemical College, Chulalongkorn University.
- Luna, F.M.T., Coelho, J.A., Otoni, J.C.F., Guimarães, A.P., Azevedo, D.C.S., and Cavalcante Jr., C.L. (2010). Studies of C<sub>8</sub> aromatics adsorption in BaY and mordenite molecular sieves using the headspace technique. Adsorption, 16, 525-530.
- Markelov, M. and Bershevits, O.A. (2001). Methodologies of quantitative headspace analysis using vapor phase sweeping. Analytica Chimica Acta, 432, 213-227.
- Milewski, M. and Berak, J.M. (1982). Effect of adsorbent preparation parameters on the selectivity of xylene isomers separation. Separation Science and Technology, 17(2), 369-374.
- Minceva, M. and Rodrigues, A.E. (2004). Adsorption of xylenes on faujasite-type zeolite: equilibrium and kinetics in batch adsorber. Chemical Engineering Research and Design, 82(A5), 667-681.
- Neuzil, R.W. (1976). Process for separating p-xylene (assigned to UOP). US Patent, 3,997,620.
- Ngamkitidachakul, T. (2000). Fundamentals of Xylene Adsorptive Separation. M.S. Thesis in Petrochemical Technology, The Petroleum and Petrochemical College, Chulalongkorn University.
- Otani, S., Akita, S., Iwamura, T., Kanaoka, M., Matsumura, K., Noguchi, Y., Sando, K., Mori, T., Takeuchi, I., Tsuchiya, T., and Yamamoto, T. (1973).

- Separation process of components of feed mixture utilizing solid sorbent. U.S. Patent, 3,761,533.
- Pichon, C., Méthivier, A., and Simonot-Grange, M.H. (2000). Adsorption of *m*-xylene on prehydrated zeolite BaX: correlation between temperature-programmed desorption and low-temperature neutron powder diffraction studies. Langmuir, 16(4), 1931-1936.
- Ruthven, D.M. (1984). Principles of Adsorption and Adsorption Process. New Brunswick: Wiley.
- Santacesarla, E., Morbidelli, M., Danise, P., Mercenari, M., and Carre, S. (1982). Separation of xylenes on Y zeolites. 1. determination of the adsorption equilibrium parameters, selectivities, and mass transfer coefficients through finite bath experiments. Industrial and Engineering Chemistry Process Design and Development, 21, 440-445.
- Suntornpun, R. (2002). Acid-Base Interaction between C<sub>8</sub> Aromatics and X and Y Zeolites. M.S. Thesis in Petrochemical Technology, The Petroleum and Petrochemical College, Chulalongkorn University.
- Torres, A.E.B., Neves, S.B., Abreu, J.C.N., Cavalcante Jr., C.L., and Ruthven, D.M. (2001). Single - and Multi-Component Liquid Phase Adsorption Measurements by Headspace Chromatography. Brazilian Journal of Chemical Engineering, 18(1).
- Tournier, H., Barreau, A., Tavitian, B., Roux, D.L., Sulzer, C., and Beaumont, V. (2000). Two experimental methods to study adsorption equilibria of xylene isomers in the liquid phase on a Y zeolite. Microporous and Mesoporous Materials, 39, 537-547.
- Varayanond, V. (2001). Competitive Adsorption of C<sub>8</sub> Aromatics and Toluene on KY and KBaX Zeolites. M.S. Thesis in Petrochemical Technology, The Petroleum and Petrochemical College, Chulalongkorn University.
- Wang, Y., McCaffrey, J., and Norwood, D.L. (2008). Recent advances in headspace gas chromatography. Journal of Liquid Chromatography & Related Technologies, 31(11), 1823-1851.

- Yan, T.Y. (1989). Separation of *p*-xylene and ethylbenzene from C<sub>8</sub> aromatics using medium-pore zeolites. Industrial & Engineering Chemistry Research, 28, 572-516.
- Yang, R.T. (1987). Gas Separation by Adsorption Process. Butterworths Publishers.
- Zhu, J.Y. and Chai, X.S. (2005). Some recent developments in headspace gas chromatography. Current Analytical Chemistry, 1, 79-83.
- Zhu, J., Trefiak, N., Woob, T., and Huang, Y. (2008). An investigation of the adsorption of aromatic hydrocarbons in zeolite Na-Y by solid-state NMR spectroscopy. Microporous and Mesoporous Materials, 114, 474-484.

## APPENDIX

## Appendix A Properties of Each Components in The Sample

Table A1 Chemical and physical properties of *p*-xylene and *m*-xylene

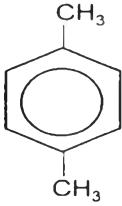
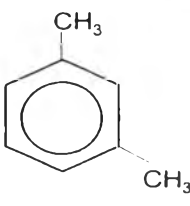
Property	<i>p</i> -Xylene	<i>m</i> -Xylene
Chemical formular	C <sub>8</sub> H <sub>10</sub>	C <sub>8</sub> H <sub>10</sub>
CAS number	106-42-3	108-38-3
Color	colorless	colorless
Chemical structure		
Molecular size (Å)	~ 6.7	~ 7.1
Henry's law constant (atm·m <sup>3</sup> /mol)	6.90x10 <sup>-3</sup>	7.18x10 <sup>-3</sup>
Water Solubility@ 25°C	198 mg/L	162 mg/L
Relative Vapor Density	3.7	3.7

Table A2 Vapour pressure of each components at various temperature

Temperature (°C)	Vapour Pressure (mmHg)			
	<i>p</i> -Xylene	<i>m</i> -Xylene	Toluene	Nonane
40	19.98	19.06	59.16	10.66
60	51.59	49.52	138.96	30.17
80	117.35	113.32	291.22	73.67
100	240.58	233.67	556.32	159.84
120	452.60	442.07	984.72	314.97

## CURRICULUM VITAE

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2. Promteerawut, K., Rangsunvigit, P., and Kulprathipanja, S. (2012, May 13-18) Use of Headspace Gas Chromatography for the Study of C<sub>8</sub> Aromatics Competitive Adsorption on Zeolites. Poster presented at International Association of Colloid and Interface Scientists 2012, Sendai, Japan.

