REFERENCES

Barthomeuf, D., and Mallmann, A. (1990). Adsorption of aromatics in *NaY* and $AlPO_4$-5 correlation with the desorbent properties in separation. Industrial Engineering Research, 29, 1435-1438.

Bellat, J.P., Pilverrdierr, 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.

Bellat, J.P., Simonot-Grange, M.H., and Julian, S. (1995). Adsorption of gaseous *p*-xylene and *m*-xylene on *NaY*, *KY*, and *BaY* zeolites: Part 1, adsorption equilibria of pure xylene. Zeolite, 15, 124-130.

Cottier, V., Bellat, J.P., and Simonot-Grange, M.H. (1997). Adsorption of *p*-xylene/*m*-xylene gas mixture on *BaY* and *NaY* zeolite. Coadsorption equilibria and selectivities. Journal of Physical Chemistry, 101, 4798-4802.

Hulme, R., Ronald, E., Weig, R., and Ruthven, D.M. (1991). Binary and ternary equilibria for C_8 aromatics on *KY* faujasite. Engineering Chemical Research, 30, 752-760.

Kulprathipanja, S. (1999). U.S. Patent 5 900 523.

Kulprathipanja, S. and Johnson, A.J. (2001). Handbook of Porous Solids Chater 6.4, Liquid Separations.

Ruthven, D.M. (1984). Principles of Adsorption and Adsorption Process New Brunswick: Wiley.

Ngamkitidachakul, T. (2000). Fundamentals of xylene adsorptive separation M.S. Thesis in Petroleum Technology, the Petroleum and Petrochemical College, Chulalongkorn University, Bangkok, Thailand.

Tournier, H., Barreau, A., Tavitian, B., Roux, D.L., Sulzer, C., and Beaumont, V. (2000). Two experimental mothods to study adsorption equilibria of xylene isomers in the liquid phase on a *Y* zeolite. Microporous and Mesoporous Material, 39(2000), 537-547.

Veromique, L.B., Lukemer, J.R., and Stulenger, N. (1998). Computation study of *p*-xylene/*m*-xylene adsorption on *NaY* zeolite. Industrial Engineering Research, 32, 1201-1213.

Yan, Y. (1989). Separation of *p*-xylene and ethylbenzene from C_8 aromatics using medium-pore zeolite. Engineering Chemical Research, 28, 572-576.

APPENDIX A

Table A-1 Parameters of the adsorption model for *KY* zeolite LOI=1.2%

Temperature (°C)	C_8 Aromatics	k_1	k_2	K_{01}	ΔH_1	K_{02}	ΔH_2
40	*p*-xylene	2.0843	0.7377	0.0208	2.8468	0.0748	1.4335
	o-xylene	0.3348	0.5506	0.0140	1.9731	0.0869	1.1484
	m-xylene	0.3494	0.4437	0.0195	1.7933	0.1324	0.7520
	ethylbenzene	0.6384	0.5971	0.0180	2.2191	0.1401	0.9017
65	*p*-xylene	1.5028	0.6150	0.0208	2.8468	0.0748	1.4335
	o-xylene	0.2648	0.4803	0.0140	1.9731	0.0869	1.1484
	m-xylene	0.2823	0.4058	0.0195	1.7933	0.1324	0.7520
	ethylbenzene	0.4903	0.5364	0.0180	2.2191	0.1401	0.9017
90	*p*-xylene	1.1334	0.5257	0.0208	2.8468	0.0748	1.4335
	o-xylene	0.2163	0.4269	0.0140	1.9731	0.0869	1.1484
	m-xylene	0.2349	0.3757	0.0195	1.7933	0.1324	0.7520
	ethylbenzene	0.3905	0.4890	0.0180	2.2191	0.1401	0.9017

Table A-2 Parameters of the adsorption model for *KY* zeolite LOI=2.4%

Temperature (°C)	C_8 Aromatics	k_1	k_2	K_{01}	ΔH_1	K_{02}	ΔH_2
40	*p*-xylene	1.9294	0.7709	0.0174	2.7936	0.0671	1.4272
	o-xylene	0.3431	0.6595	0.0083	2.3140	0.1693	0.8458
	m-xylene	0.3518	0.5395	0.0302	1.5274	0.1179	0.9456
	ethylbenzene	0.6399	0.7752	0.0363	1.7838	0.0604	1.5876
65	*p*-xylene	1.3890	0.6437	0.0174	2.7936	0.0671	1.4272
	o-xylene	0.2606	0.5964	0.0083	2.3140	0.1693	0.8458
	m-xylene	0.2933	0.4821	0.0302	1.5274	0.1179	0.9456
	ethylbenzene	0.5176	0.6418	0.0363	1.7838	0.0604	1.5876
90	*p*-xylene	1.0463	0.5510	0.0174	2.7936	0.0671	1.4272
	o-xylene	0.2055	0.5468	0.0083	2.3140	0.1693	0.8458
	m-xylene	0.2508	0.4376	0.0302	1.5274	0.1179	0.9456
	ethylbenzene	0.4311	0.5454	0.0363	1.7838	0.0604	1.5876

Table A-3 Parameters of the adsorption model for *KY* zeolite LOI=4.4%

Temperature (°C)	C_8 Aromatics	k_1	k_2	K_{01}	ΔH_1	K_{02}	ΔH_2
40	*p*-xylene	1.6314	0.7930	0.1041	1.6923	0.0583	1.6035
	o-xylene	0.3216	0.5906	0.0387	1.3176	0.4441	0.1772
	m-xylene	0.3772	0.6265	0.0346	1.4863	0.0985	1.1508
	ethylbenzene	0.7008	0.9075	0.1182	1.1067	0.2733	0.7465
65	*p*-xylene	1.2583	0.6181	0.1041	1.6923	0.0583	1.6035
	o-xylene	0.2750	0.5782	0.0387	1.3176	0.4441	0.1772
	m-xylene	0.3161	0.5464	0.0346	1.4863	0.0985	1.1508
	ethylbenzene	0.6143	0.8304	0.1182	1.1067	0.2733	0.7465
90	*p*-xylene	1.0059	0.4986	0.1041	1.6923	0.0583	1.6035
	o-xylene	0.2402	0.5678	0.0387	1.3176	0.4441	0.1772
	m-xylene	0.2714	0.4856	0.0346	1.4863	0.0985	1.1508
	ethylbenzene	0.5484	0.7692	0.1182	1.1067	0.2733	0.7465

Table A-4 Parameters of the adsorption model for *KBaX* zeolite LOI=1.2%

Temperature (°C)	C_8 Aromatics	k_1	k_2	K_{01}	ΔH_1	K_{02}	ΔH_2
40	*p*-xylene	1.5505	1.0223	0.0444	2.2104	0.0622	1.7413
	o-xylene	0.3735	0.7244	0.0503	1.2464	0.2395	0.6883
	m-xylene	0.3887	0.6312	0.1919	0.4389	0.3547	0.3584
	ethylbenzene	0.5625	0.6723	0.2557	0.4902	0.5248	0.1541
65	*p*-xylene	1.1921	0.8311	0.0444	2.2104	0.0622	1.7413
	o-xylene	0.3220	0.6675	0.0503	1.2464	0.2395	0.6883
	m-xylene	0.3689	0.6049	0.1919	0.4389	0.3547	0.3584
	ethylbenzene	0.5306	0.6601	0.2557	0.4902	0.5248	0.1541
90	*p*-xylene	0.9503	0.6952	0.0444	2.2104	0.0622	1.7413
	o-xylene	0.2834	0.6220	0.0503	1.2464	0.2395	0.6883
	m-xylene	0.3527	0.5831	0.1919	0.4389	0.3547	0.3584
	ethylbenzene	0.5046	0.6497	0.2557	0.4902	0.5248	0.1541

Table A-5 Parameters of the adsorption model for *KBaX* zeolite LOI=2.5%

Temperature (°C)	C_8 Aromatics	k_1	k_2	K_{01}	ΔH_1	K_{02}	ΔH_2
40	*p*-xylene	1.4586	1.1597	0.0208	2.6445	0.5799	0.4310
	o-xylene	0.4568	0.6788	0.1251	0.8053	0.2169	0.7095
	m-xylene	0.4337	0.5023	0.2724	0.2891	0.0703	1.2234
	ethylbenzene	0.7968	0.7383	0.1384	1.0886	0.4175	0.3546
65	*p*-xylene	1.0650	1.1018	0.0208	2.6445	0.5799	0.4310
	o-xylene	0.4151	0.6239	0.1251	0.8053	0.2169	0.7095
	m-xylene	0.4190	0.4343	0.2724	0.2891	0.0703	1.2234
	ethylbenzene	0.7000	0.7078	0.1384	1.0886	0.4175	0.3546
90	*p*-xylene	0.8120	1.0541	0.0208	2.6445	0.5799	0.4310
	o-xylene	0.3822	0.5801	0.1251	0.8053	0.2169	0.7095
	m-xylene	0.4068	0.3831	0.2724	0.2891	0.0703	1.2234
	ethylbenzene	0.6261	0.6825	0.1384	1.0886	0.4175	0.3546

Table A-6 Parameters of the adsorption model for *KBaX* zeolite LOI=4.5%

Temperature (°C)	C_8 Aromatics	k_1	k_2	K_{01}	ΔH_1	K_{02}	ΔH_2
40	*p*-xylene	1.4300	1.2550	0.1221	1.5305	0.0557	1.9376
	o-xylene	0.4796	0.7377	0.4513	0.0378	0.6588	0.0703
	m-xylene	0.4990	0.6741	0.3023	0.3118	0.0647	1.4572
	ethylbenzene	0.7811	0.7751	0.3879	0.4353	0.4241	0.3750
65	*p*-xylene	1.1921	0.9967	0.1221	1.5305	0.0557	1.9376
	o-xylene	0.4775	0.7315	0.4513	0.0378	0.6588	0.0703
	m-xylene	0.4808	0.5668	0.3023	0.3118	0.0647	1.4572
	ethylbenzene	0.7417	0.7413	0.3879	0.4353	0.4241	0.3750
90	*p*-xylene	1.0189	0.8171	0.1221	1.5305	0.0557	1.9376
	o-xylene	0.4756	0.7263	0.4513	0.0378	0.6588	0.0703
	m-xylene	0.4657	0.4881	0.3023	0.3118	0.0647	1.4572
	ethylbenzene	0.7093	0.7133	0.3879	0.4353	0.4241	0.3750

APPENDIX B

Additional References

Argauer, R.J., and Landolt, G.R. (1972). U.S. Patent 3 702 886.

Bekkum, H.V., Flanigen, E.M., and Jansen, J.C. (1991). Introduction to Zeolite Science and Practice New York: Elsevier Science Publishers B.V.

Boughton, D.B. (1983). Development of the Parex process for separation of *p*-xylene from C_8 hydrocarbon mixtures. Journal of American Chemical Society, 28(4), 1072.

Boutin, A., Tavitian, B., and Alain, H. (1998). Computational study of *p*-xylene/*m*-xylene mixtures adsorbed in *NaY* zeolite. Journal of Physical Chemistry, 102, 9224-9233.

Broughton, D.B., Nuezil, R.W., Pharis, J.M., and Breaely, C.B. (1970). The Parex process for recovering *p*-xylene. Chemical Engineering Progress, 66(9), 70-75.

Catlow, C.R.A. (1992). Modeling of Structure and Reactivity in Zeolite San Diego: Academic Press Limited.

Dessau, R.M. (1980). Selective sorption properties of zeolite. ACS Symposium Series, 35, 123-135.

Jeanneret, J.J., Low, C.D., and Zukauskas, V. (1994). New strategies maximize *p*-xylene production. Hydrocarbon Processing, 158, 43-49.

Kulprathipanja, S. (1996). U.S. Patent 5 495 061.

Milewski, M. (1981). Separation of mixtures of ethylbenzene and xylene isomers by adsorption methods. Przemysl Chemiczny, 60(2), 71-92.

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.

Neuzil, R.W. (1976). U.S. Patent 3 997 620.

Seko, M., Miyake, and T., Inada, K. (1980). Sieves for Mixed Xylenes Separation. Hydrocarbon Processing, 113, 133-139.

Smolin, W., and Fishkill, N.Y. (1982). U.S. Patent 4 351 981.

Snyder, L.R. (1968). Principles of Adsorption Chromatography New York: Marcel Dekker, Inc.

Tien, C. (1994). Adsorption Calculations and Modeling Washington: Butterworth-Heinemann.

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