Gas-Liquid Partition Chromatography of m- and p-Xylenes on α-Naphthylamine

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(Received November 27, 1959)

Recently, Zlatkis, Ling and Kaufman[1] reported the resolution of isomeric xylenes by gas-liquid partition chromatography, and a good separation of *m*- and *p*-xylene was attained by using 1-chloronaphthalene as the liquid substrate. The isomers, *m*- and *p*-xylene have now been resolved. The stationary liquid phase used was α-naphthylamine which is expected to show an ionic character similar to that of 1-chloronaphthalene in the partition of xylenes. A value for the relative peak separtion[2] ($S_{12}=0.085$) for α-naphthylamine was better than the reported value for 1-chloronaphthalene ($S_{12}=0.060$)[1].

Since α-naphthylamine is known to be quite unstable, the end of the column (approximately 7 cm.) was packed with a bare solid support C-22 to maintain a stable base line. When ethylbenzene was present in the aromatic samples, this stationary liquid would not separate *p*-xylene from ethylbenzene. A chromatogram is illustrated in Fig. 1, and experimental conditions and data are listed in Table I.

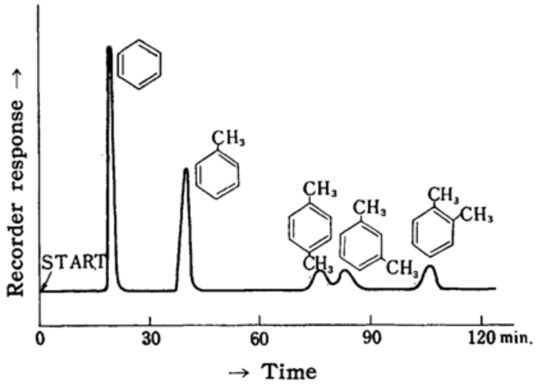

Fig. 1. Chromatogram of aromatic hydrocarbon mixture.
Column; 293 cm. × 6 mm. α-naphthylamine (32:100) w/w on C-22 firebrick (50∼60 mesh) + 7 cm. × 6 mm. bare C-22 firebrick (50∼60 mesh) at the end of column. Temp., 87°C.
N_2 flow rate: 45.7 ml./min., 0.02 ml. of sample was charged.

TABLE I. EXPERIMENTAL DATA OBTAINED

Relative retention volume (toluene = 1.00) at 87°C

Benzene	Toluene	Ethylbenzene
0.45	1.00	1.95
p-Xylene	*m*-Xylene	*o*-Xylene
1.97	2.13	2.76

Relative peak separation $S_{12}=0.085$ (*p*-xylene and *m*-xylene).

Resolution $R=0.93$ (*p*-xylene and *m*-xylene).

Theoretical plate number (*o*-xylene); 2800

$$S_{12}=(t_2-t_1)/t_1,\quad R=(t_x\cdot S_{12})/w$$

where t_1 = elution time of first peak,
t_2 = elution time of second peak,
t_x = elution time of given peak,
w = peak width at base line.

More detatiled information on this subject will be published elsewhere.

The authors wish to thank the support of Yawata Chemical Industry Co. for assembling the gas-chromatograph instruments used in this study. This work has been carried out by the Scientific Research Grant-in-aid of the Ministry of Education.

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[1] A. Zlatkis, S. Ling and H. R. Kaufman, *Anal. Chem.*, **31**, 945 (1959).

[2] W. L. Jones and R. Kieselbach, ibid., **30**, 1590 (1958).