individually or in combinations with one another in chromatography of proteins on hydroxylapatite; often it is difficult to ascertain which buffer cation was used. Our results show the importance of knowing exactly which buffer cation is used.

Northern Regional Research Laboratory,
Northern Utilization Research and Development Division,
Agricultural Research Service,
U.S. Department of Agriculture, Peoria, Ill. (U.S.A.)

W. J. WOLF
DAYLE ANN SLY

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Gas chromatographic analysis of ethylene and some fluoroethylenes

It was of interest in a recent investigation[1] to separate the C_2-olefius ethylene, 1,1-difluoroethylene and tetrafluoroethylene. Silica gel and silver nitrate–ethylene glycol packings show excellent separational properties for hydrocarbons and olefins[2,3], and in the present work these materials have been used to separate the C_2-olefins.

Using silica gel alone it is found that 1,1-difluoroethylene is separated from the ethylene and tetrafluoroethylene peak, while silver nitrate–ethylene glycol separates ethylene from the fluoroolefins. The quantitative separation of all three olefins is achieved by using both column materials in series.

Experimental and results

Silver nitrate in diethylene glycol on a firebrick support was purchased from the Perkin-Elmer Co., as was the silica gel. A Perkin-Elmer gas chromatograph (154-C) was used.

The silver nitrate phase was packed into a 12 ft. length of $^1/_4$ in. O.D. aluminium tubing and coiled, while the silica gel was contained in a 3.3 ft. Pyrex glass column;

TABLE I

Column used	*Retention times (min)*		
	C_2H_4	CF_2CH_2	C_2F_4
Silver nitrate–ethylene glycol	12.5	7.0	7.0
Silica gel	14.2	19.0	14.2
Silver nitrate–ethylene glycol plus silica gel	30.8	25.6	21.6

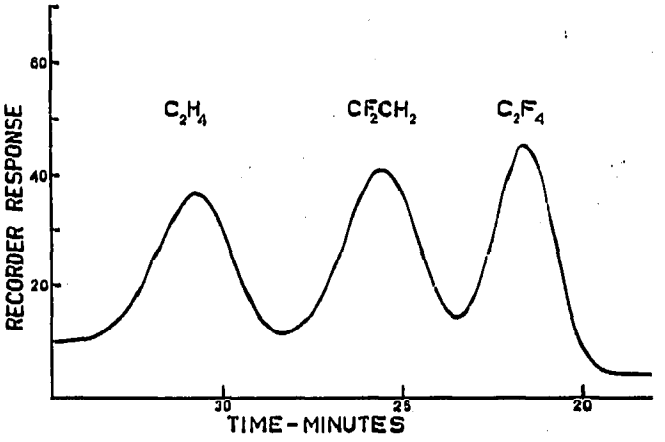

Fig. 1. Chromatogram of olefin mixture (25°, flow rate 36 ml/min).

the latter column was pretreated with nitrogen at 100° before use. Hydrogen was used as a carrier gas at a flow rate of 36 ml/min column temperature was 25°. The olefin mixtures were approximately equimolar and sample size was 0.06 ml.

The rasults of the separation are given in terms of retention times and are recorded in Table I; the recorded chromatograph using the combined columns is shown in Fig. 1.

Retention times may be decreased with some loss in separation by increasing the carrier flow and column temperature. A chromatogram at 45° and flow rate of 70 ml/min is shown in Fig. 2.

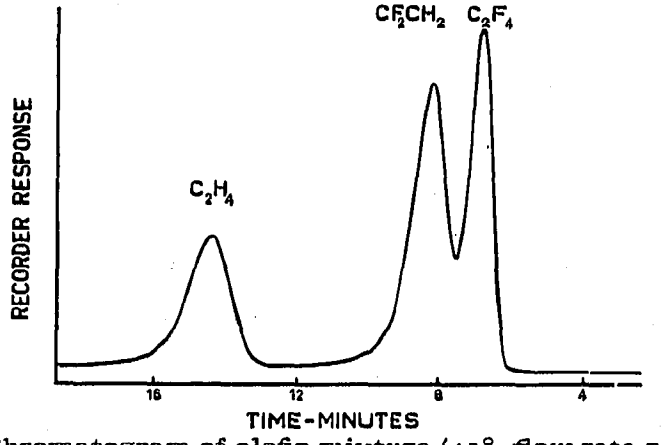

Fig. 2. Chromatogram of olefin mixture (45°, flow rate 70 ml/min).

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Department of Physical and Inorganic Chemistry,
University of Adelaide (South Australia)

N. L. ARTHUR
T. N. BELL

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