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Note

A simple, sensitive determination and identification of vinyl chloride by gas chromatography with a Hall detector

G. F. ERNST and J. B. H. VAN LIEROP
Food Inspection Service, Nyenoord 6, Utrecht (The Netherlands)
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Recent publications have emphasized the toxicity of vinyl chloride monomer (VCM)[1]. In The Netherlands the Public Health Authorities have ordered a limit to the amount of VCM in food and this method for the determination of VCM was therefore developed in order to monitor VCM in food products.

VCM may be present in polyvinyl chloride packaging materials, for instance bottles, and may migrate into the contents, such as wine, vinegar and soft drinks. The VCM can be removed from the food by extraction with *m*-xylene and this extract can be analyzed by gas chromatography.

Methods involving many different types of columns and detectors have been described. However, these methods use the retention time as the only proof of identity. Even the use of two different columns does not give sufficient evidence, because compounds extracted with *m*-xylene from wine; for instance, can have the same gas chromatographic behaviour as VCM.

A more specific detector than a flame ionization or thermal conductivity detector was needed. Williams and Umstead[2] used a Dohrmann microcoulometer for the determination of halogenated hydrocarbons. The selective microelectrolytic conductivity detector according to Hall[3] is specific for halogens. We analyzed *m*-xylene extracts from foods on apolar columns with this detector and could identify and determine VCM even in nanogram amounts. The sample, having passed through the column, is reduced with hydrogen in a quartz tube and the conductivity of the hydrogen chloride formed is measured.

EXPERIMENTAL AND RESULTS

A Hewlett Packard 5750A gas chromatograph was equipped with a 4 m × 1/8 in. O.D. stainless-steel column, filled with 5% SE-30 on 80–100 mesh Chromosorb G (AW, DMCS). The Tracor 310 detector according to Hall[3] was connected to the gas chromatograph by a quartz tube of length 15 cm and I.D. 2 mm. The carrier gas (argon) had a flow-rate of *ca.* 5.5 ml/min, and hydrogen was passed into the quartz tube in an oven at 820° at an inlet pressure of 10 p.s.i.

Samples of 2.5 μl were injected at 90° isothermally. The sensitivity for 0.5 full-scale deflection was 4.0 ng of VCM, using a 1-mV recorder with a speed of 5 min/in. at a detector sensitivity setting of 10, attenuation 1.

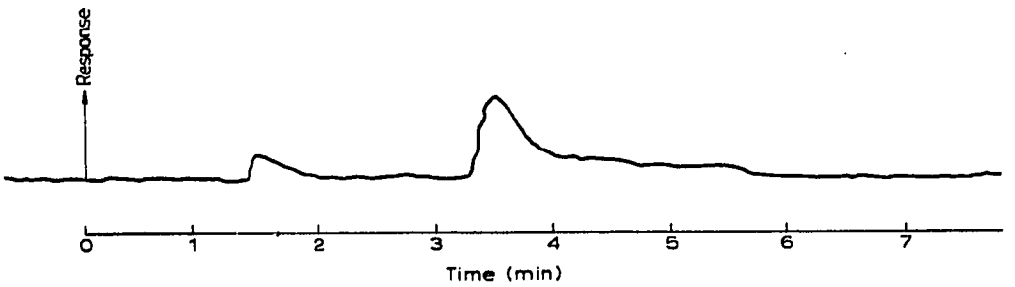

Fig. 1. Chromatogram of *m*-xylene.

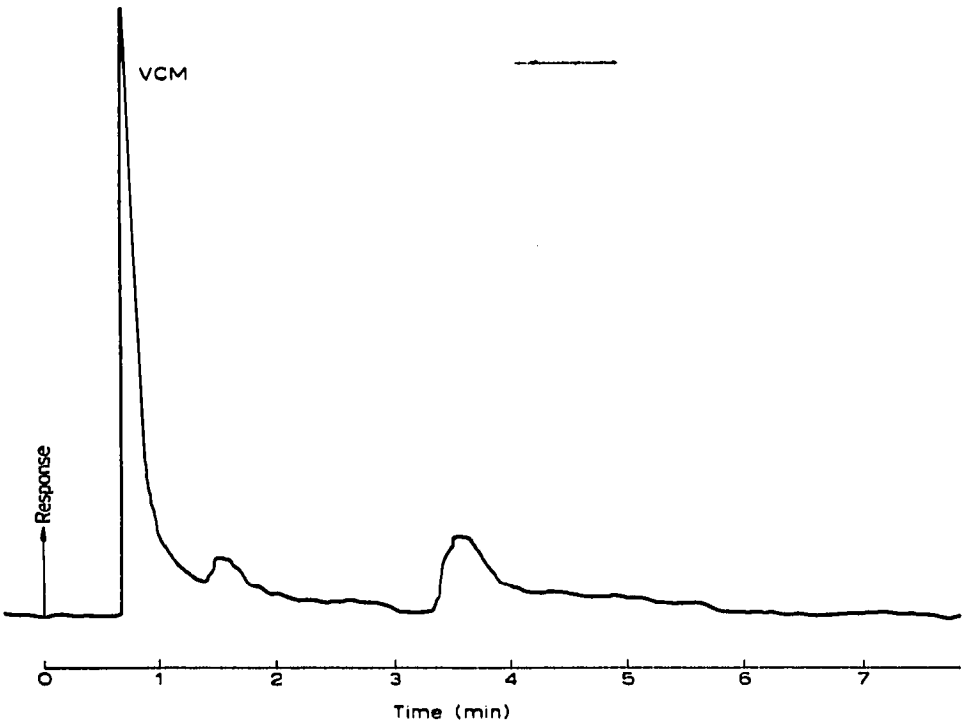

Fig. 2. Chromatogram of *m*-xylene containing 2.6 ppm (w/v) VCM.

Chromatograms of *m*-xylene and of *m*-xylene containing 2.6 ppm of VCM are shown in Figs 1 and 2.

The method was tested on *m*-xylene extracts from wine containing 0.1 ppm of VCM and the results will be published in this journal.

REFERENCES

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