Short Communications

Ionization detector for gas chromatography: A modification without radiation source

LOVELOCK's detector[1] can be used without radiation source if it is constructed of glass. This modification is especially useful for the analysis of methyl esters of fatty acids. It seems to possess the same characteristics of response as the ^{90}Sr detector. The absence of the strontium plate causes a considerable fall of the basic ionization current and increases the stability of the detector at higher anode potentials and gives a lower noise level. The sensitivity is at least of the same order as that of LOVELOCK's detector.

The original problem was to find out whether the radioactive samples emerging from the column could replace the ^{90}Sr source. It was expected that only radioactive fractions would be indicated, when the ^{90}Sr source was removed. However, all the fractions gave a response.

To facilitate the cleaning of the ionization chamber, the detector was made of two parts, connected by a B-29 ground Pyrex glass joint (Fig. 1). The central electrode

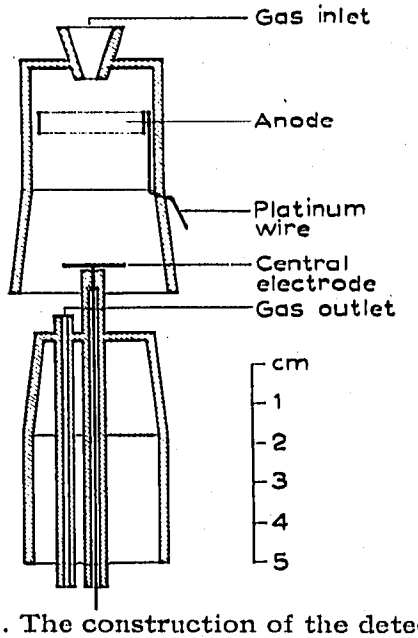

Fig. 1. The construction of the detector.

was a 12 × 0.5 mm platinum disk. Either a radiation source of 10 mC ^{90}Sr in a 0.3 × 25 × 71 mm silver plate (Code SIC 9, Radiochemical Centre, Amersham, Bucks.) or an aluminium plate served as anode. The electrical connections to both electrodes were of platinum wire.

The response of this detector was studied in a gas chromatography apparatus according to JAMES[2], which was made in our laboratory using a 4 ft. glass column of 4 mm diameter filled with Celite 545 of 100–120 mesh containing 20 % (w/w) Apiezon L grease as stationary phase. Commercial argon (99.8 %) at an inlet pressure of 0.5 atm. was used as carrier gas. The column and the detector were maintained at a temperature of +180°. The theoretical plate number was about 1500 (calculated for methyl laurate). The ionization current was amplified by a feedback electrometer amplifier with 5000 MΩ input resistance and recorded by a 50 mV Honeywell recorder.

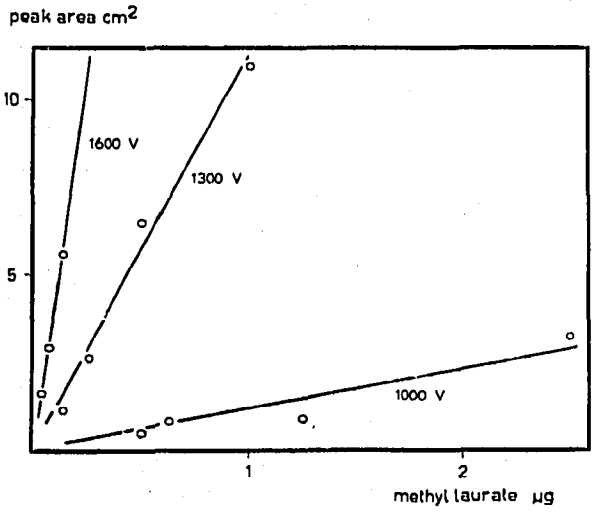

Fig. 2. The recorded peak area, when various amounts of methyl laurate were introduced into the detector. The lines obtained with three different anode potentials (1000, 1300 and 1600 V) are shown.

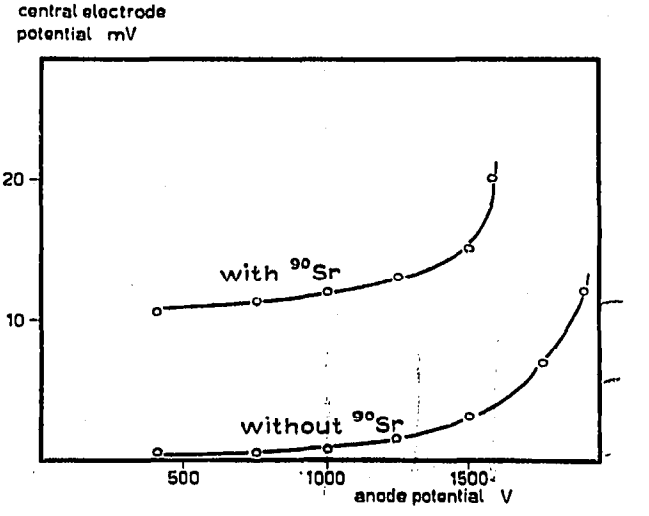

Fig. 3. The central electrode potential in pure argon with a ^{90}Sr source or with an Al-plate as the anode.

Fig. 2 illustrates the response of the detector, as indicated by the recorded peak areas plotted against the amount of methyl laurate (µg) introduced into the column. Using a potential of 2000 V and applying 0.1 µl of a 1:200,000 dilution, the detector still gave a well detectable response (peak area 0.36 cm²) which corresponds to $5 \cdot 10^{-4}$ µg of methyl laurate. The quality of the records was not affected. In Fig. 3 the central electrode potential is plotted against the voltage applied to the anode, with pure argon in the detector.

We suggest that the responses are due to differences in the conductivity of the gases passing the detector.

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[1] J. E. LOVELOCK, *J. Chromatog.*, 1 (1958) 35.
[2] A. T. JAMES, Personal communication.

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