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Note

Use of carbon disulphide and formamide as the mobile phase and flame-forming agent in the flame-ionization detector*

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The flame-ionization detector is the most commonly used high-sensitivity detector in gas chromatography, and the most common flame-forming agent in these detectors is hydrogen, although other substances, such as carbon monoxide[1], ammonia[2] and possibly formic acid[3], have been used.

In the simplest chromatographic experiments, the flame-forming agent also acts as the mobile phase; in many instances it is expedient to use vapours of organic substances as the mobile phase. Vapour-phase chromatography enables the experimenter to improve a number of chromatographic characteristics and actively control the chromatographic process by changing the nature of not only the stationary phase but also the mobile phase in the column[2–5].

The practical value of vapour-phase chromatography, however, depends on the possibility of using a simple, highly sensitive detector. We have used formamide and carbon disulphide vapour as the mobile phase and flame-forming agent simultaneously without the additional use of hydrogen as flame-forming agent.

The procedure was generally similar to that adopted in vapour-phase chromatography. The two substances were heated in a steam generator, the vapours formed were fed to a column located in a thermostat at a higher temperature, and then the flow of mobile phase was directed, together with the separated zones of the test substances, to a conventional flame-ionization detector. It should be noted that in our version, electrolyzers or the bulky cylinders containing hydrogen are replaced with a steam generator containing more capacious (as regards steam production) and less dangerous substances.

An important property of the substances used is that the sensitivity of detection for most compounds (alkanes, amines, aromatic hydrocarbons, esters) is slightly lower than when hydrogen is used as the flame-forming agent, but the background current increases. We consider that the use of these compounds as the mobile phase in liquid chromatography would allow us universally to detect separated compounds with a high-sensitivity flame-ionization detector.

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In our opinion, the use of carbon disulphide and formamide as the vapour-phase mobile phase and flame-forming agent in a flame-ionization detector opens up new possibilities for simplifying chromatographic equipment and the procedures used.

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