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Note

Improvement in the determination of sulphur hexafluoride for use as a blood tracer

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Sulphur hexafluoride is a gas that has a very low solubility in blood and for this reason many physiologists use it for determining physiological shunts[1]. Sulphur hexafluoride is dissolved in physiological liquid and perfused intravenously and, when it reaches the pulmonary capillaries, it passes into the alveolar air. The greater the amount of blood that has not been in contact with the pulmonary alveolar air, the higher is the concentration of sulphur hexafluoride in the arterial blood.

Sulphur hexafluoride passing out of the blood is detected with an electron-capture detector; sulphur hexafluoride is separated from oxygen by means of a column (6 ft. × 1/8 in. I.D.) filled with Porapak T (80–100 mesh), with an oven temperature of 70° and a carrier gas (helium) flow-rate of 40 ml/min[2,3].

With many blood samples, however, and especially in pathological conditions such as acidosis or in the event of prolonged anaesthesia, a peak that we have not identified occurs simultaneously with the passage of sulphur hexafluoride and shows a maximum that is sometimes higher than that of sulphur hexafluoride. This unidentified peak is very noticeable at low oven temperatures; Fig. 1 shows the results obtained at 23°, 40° and 70°.

Although the separation is good at 23°, this temperature cannot be used for physiological measurements as certain peaks for sulphur hexafluoride would be too small and would give a signal-to-noise ratio of less than 2. In order to solve this problem, we used a column of stainless-steel tubing packed with a molecular sieve 5A that had been carefully screened to provide a 190–210-μm fraction; it has the additional advantage of ensuring that the sulphur hexafluoride is eluted before the oxygen[4]. The separation of sulphur hexafluoride from the parasite peak can be readily ensured by using a column of dimensions 4 m × 1/4 in. I.D., an oven temperature of 155° and a carrier gas flow-rate of 40 ml/min (Fig. 2).

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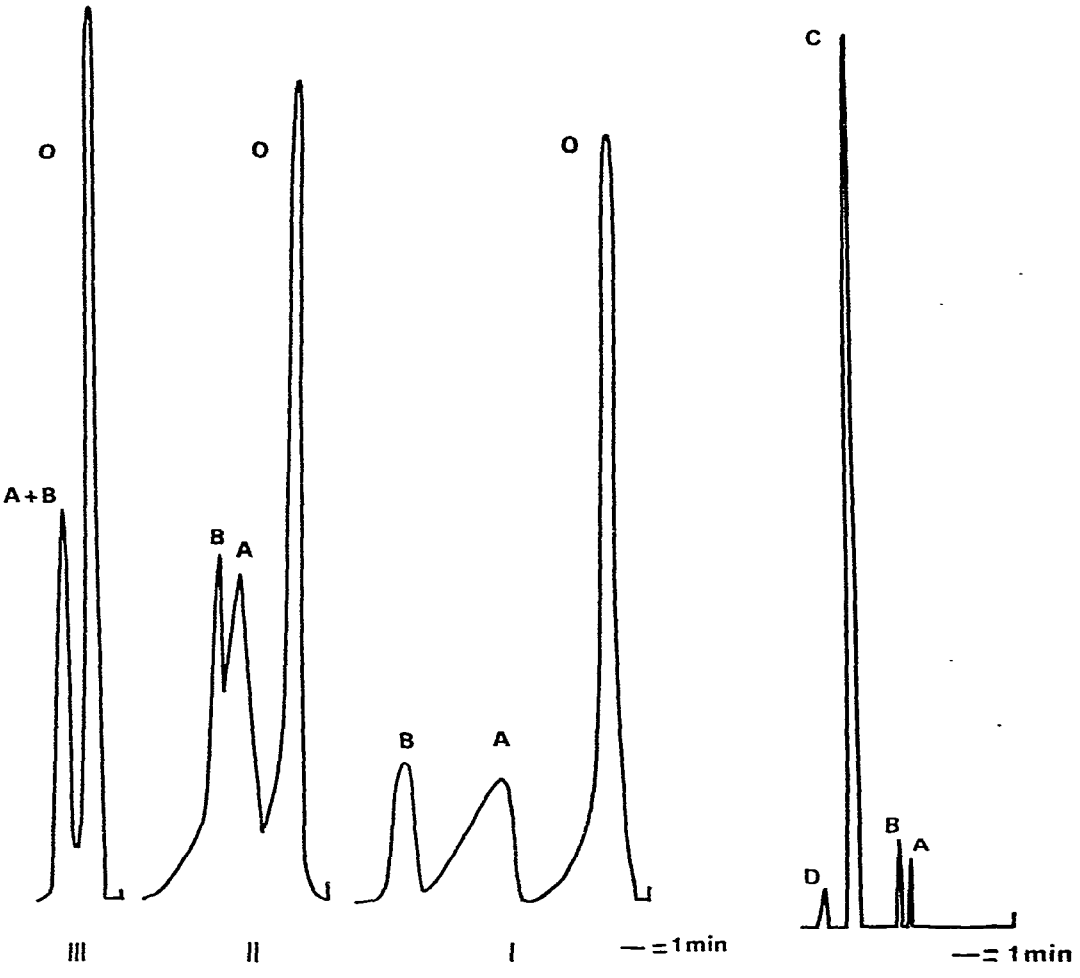

Fig. 1. Separation of oxygen (O) from sulphur hexafluoride (A) and the unidentified peak (B) by means of a column (6 ft. × 1/8 in. I.D.) filled with Porapak T (80–100 mesh); the carrier gas flow-rate was 40 ml/min and the temperature of the oven was 23° (I), 40° (II) or 70° (III).

Fig. 2. Separation of sulphur hexafluoride (A) from the unidentified peaks (B and D) and oxygen (C) by means of a column (4 m × 1/4 in. I.D.) filled with molecular sieve 5A (190–210-μm cut fraction), the carrier gas flow-rate being 40 ml/min and the temperature of the oven 155°.

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