Development method in GC of permanent gases separation

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Introduction

The separation of permanent gases is not a classic separation in gas chromatography. This analysis is often used in industry however it presents many problems.
Indeed, it is not easy to separate these compounds with a classic mounting because there are two stationary phases for the separation. In addition, for this analysis, a pulsed discharge ionisation detector with a high sensitivity and a long time of stability was used. The aim of this study was to develop a system allowing to separate permanent gases and to achieve a "heart-cut" in a compound with two types of gas sampling valves : Analytical Flow Product and Valco. However, the "heart-cut" part will not be treated in this article.

Figure 1 : Chromatographic mounting

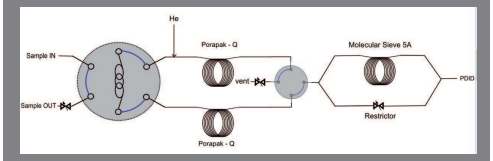
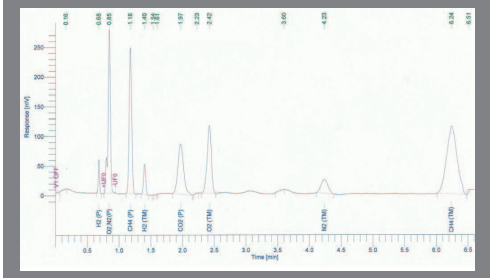


Figure 2 : Standard chromatogram
(TM): compounds separated with Molecular Sieve
(P): compounds separated with Porapak-Q



Material and methods

The mounting was developed to separate permanent gases (Figure1). Permanent gases separation was achieved without "heart-cut".
- Gas chromatograph : GC Clarus 500 from Perkin Elmer
- Three packed columns :
  . 2 Porapak of type Q
    (L=3m ; d=1/8")
  . 1 Molecular sieve
    (L=2.80m ; d=1/8"; pore diameter=5Å; Grainsize=60/80 Mesh)
- Detector : pulsed discharge ionisation detector
- Detector temperature : 150°C
- Range : 20
- Attenuation : 2
- Oven temperature : 60°C
- Flow in columns : 30 ml/min
- Detector flow : 30ml/min
- Injection loop : V=68µl
- Standard : H_2, O_2, N_2, CH_4 and CO_2 (5ppm)

Results and discussion

The chromatogram (Figure 2) shows standard permanent gases separation with the described chromatographic assembly (Figure 1).
There is a co-elution between O_2(P) and N_2(P) but only H_2(TM), CO_2(P), O_2(TM), N_2(TM) and CH_4(TM) are representative components for that analysis.
In addition, retention time for CO_2(P) is shorter than those from O_2(TM) and N_2(TM).
According to these results, we are allowed to confirm that the attached chromatographic drawing is correct to get good resolution and good separation for permanent gases, and it was very interesting because we observed good resolution (quantification too) for the CO_2, even in the case of components in an air matrix.

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