

Optimization of the analysis method for NPK in fertilizers using ionic chromatography

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Introduction

Nowadays, fertilizers are extensively used in agriculture. Plantin is a company which manufactures and sells fertilizers and it has to provide a quality service to customers. Fertilizers are compounds of nutrients such as nitrogen (N), phosphorus (P) and potassium (K). These three compounds are named NPK.

The laboratory wanted to develop a method for quantifying NPK content in fertilizers and was searching the optimal condition of separation.

Experimental conditions

The assay method used was the ionic chromatography.

Analyses were performed on a Dionex DX 120 composed of two columns anion and cation exchange and equipped with two self regenerating suppressors. The detection system is a conductivity cell.

The flow rate was set at 1 mL/min

For anion exchange the eluent used, was a combination to Na_2CO_3 and NaHCO_3 in proportions to be determined.

Results and discussion

Several injections were needed to determine the concentration of two eluents.

Various injections were performed with different proportions and we obtained several chromatograms. Two chromatograms were selected and are presented in figure 1.

The chromatogram A was performed with proportions 5mM to Na_2CO_3 and 4 mM to NaHCO_3 . The analysis time was 8 minutes, but there were coelution between the ion nitrate and phosphate.

The chromatogram B was performed with proportions 4mM to Na_2CO_3 and 1 mM to NaHCO_3 . The analysis time increased to 10 minutes, but the four anions were separated without coelution. The selectivity is greater than 1. The analysis time recommended by the laboratory should be less than 15 minutes.

Conclusion

In conclusion, the optimal working condition selected for the anion separation was: $\text{Na}_2\text{CO}_3/\text{NaHCO}_3$ 4mM/1mM, flow=1mL/min

This technique can be used to quantify anions in fertilizers.

Figure 1 : Chromatogram of separation of anion in fertilizers

- A) With eluent $\text{Na}_2\text{CO}_3/\text{NaHCO}_3$ 5mM/4mM
B) With eluent $\text{Na}_2\text{CO}_3/\text{NaHCO}_3$ 4mM/1mM

