

Nitrogen determination in sodium nitrate and fertilizer

Kjel Line and MultiDist:

Nitrogen determination in sodium nitrate and fertilizer by Devarda distillation

1. Introduction

An easy, quick and sensitive method for the analysis of nitrogen in sodium nitrate and fertilizer using the Devarda method is described in this application note. Devarda distillation with the steam distillation unit MultiKjel was followed by boric acid titration on the Metrohm Eco Titrator. Coupling the new MultiKjel system and the Eco Titrator results in excellent performance with ease and speed of the analysis. The Devarda method is used for the determination of nitrogen as sum parameter in nitrate and nitrite. However, this method is not suitable in the presence of organic compounds, calcium cyanamide or carbamide.

2. Experiment

Sample:

Fertilizer Sample bought at local supermarket; declared N-Content of 15 % (Nitrate+Ammonia) with traces of carbamide

Equipment:

MultiKjel coupled with Metrohm EcoTitrator (11K36531210) (outfitted specialized Devarda Splash protector)

Procedure:

Samples are carefully weighed in a sample tube, 2 g of Devarda Alloy is added. After alkalization and 5 min of reaction time a direct distillation with subsequent boric acid titration is performed.

Distillation parameters are as presented in Table 1. (For detailed procedure please refer to AN754/2021)

Table 1. Distillation and Titration parameters on MultiKjel

Parameter	Parameters Devarda Distillation
H ₂ O Volume	35 mL
NaOH Volume	30 mL
Reaction Time	300 s
Distillation Time	200 s
Titration Type	Boric Acid Titration
H ₃ BO ₃ Volume	100 mL (4%)
Sensor type	Potentiometric (pH)
Endpoint pH	4.65
Titrant	H ₂ SO ₄ 0.1mol/L



3. Results

The average recovery for the sodium nitrate measurements were 100.296%.

Table 2: Determined Nitrogen contents (rsd in brackets, n=5).

Product	Nitrogen content (+RSD)	Digestion method	Kjel Line instrument
Sodium Nitrate	16.529% (0.049%)	Direct Devarda Distillation	MultiKjel
Fertilizer Sample	16.420% (1.21%)	Direct Devarda Distillation	MultiKjel

4. Conclusion

The determination of nitrogen in sodium nitrate and fertilizer according to the presented method and using the MultiKjel provides reliable and reproducible results. These results correspond well to the given value of sodium nitrate. The recovery rate was within the specification of 98 - 102 %.

5. References

AN754/2021, Operation Manual Kjel Line, Operation Manual Dist Line