

Ammonia determination in wastewater *Kjel Line and MultiDist*

1. Introduction

Nitrogen in water and wastewater can be found in several forms, organic and inorganic. A wastewater treatment plant removes different nitrogen sources until the regulatory standards are met. Therefore, the determination of both Total Kjeldahl Nitrogen (TKN) and ammonia is of great importance. Ammonia was determined by steam distillation followed by colorimetric titration in boric acid with the MultiKjel and Metrohm Eco Titrator, respectively, according to ISO 5664 [1], DIN 38 406-E5-2 [2], EPA 350.2 [3], AOAC 973.49 [4].

2. Experimental

Equipment: MultiKjel or MultiDist with titrator, for example Metrohm Eco Titrator

Procedure: A steam distillation protocol followed by a colorimetric titration employing MultiKjel, coupled with Metrohm Eco Titrator with parameters and settings according to Table 1.

Table 1: Parameters for distillation and titration with the MultiKjel and Eco Titrator, respectively.

Method parameters MultiKjel		Instrument Settings	
Reaction Detection	Off	MaxAccuracy mode	On
H ₂ O Volume	0 mL	Chiller/Tap water	Chiller F-314
NaOH Volume	32 mL	Chiller temperature	10°C
Reaction Time	5 s	AutoDist mode	On
Steam Steps	Fixed time		
Steam Power	100 %	Automated Titration on Eco Titrator	
Level Detection	Off	Eco Titrator Method	MET (Blanks) / DET (Samples)
Distillation Time	180 s	Titration	H ₂ SO ₄ 0.01 M
Stirrer Speed Distillation	5	Sensor type	Colorimetric
Titration Type	Boric acid titration	Volume increment	0.05 mL for blanks
H ₃ BO ₃ Volume	60 mL (2%)	Titration rate	Fast for samples
Stirrer Speed Titration	8	Stop EP	1
Titration start time	180 s	Volume after EP	0.7 mL
Sample Tube Aspiration	40s	EP Criterion	20 mV
Receiver Aspiration	30s		



3. Results

The ammonia content of raw sewage, primary and secondary effluent was determined. The results are listed in Table 2.

Table 2: Results of the ammonia determination. Sample volume: 100 mL (n=2).

Sample	V _{Sample} [mL]	NH ₄ _{measured} [mg]	Ammonia conc. [mg/L]	Mean value [mg/L]
Raw sewage sample	8.4514	2.9419	29.419	29.38 rsd : 0.17%
	8.4321	2.9349	29.349	
Primary effluent sample	9.6668	3.3808	33.808	33.91 rsd : 0.44%
	9.7247	3.4017	34.017	
Secondary effluent sample	1.0164	0.2570	2.570	2.51 rsd : 3.42%
	0.9828	0.2448	2.448	

4. Conclusion

The determination of ammonia in wastewater using the MultiKjel system provides reliable and reproducible results.

5. References

- [1] ISO 5664, Water quality – Determination of ammonium – Distillation and titration method
- [2] DIN 38 406-E5-2 Bestimmung des Ammonium-Stickstoffs-Massanalytische Bestimmung nach Destillation (Determination of ammonia nitrogen-titration after distillation)
- [3] EPA 350.2 Nitrogen-Ammonia (colorimetric, titrimetric, potentiometric-distillation procedure)
- [4] AOAC 973.49 Nitrogen (Ammonia) in water

For more information, please refer to Application Note 828/2023.