Method Abstract

Scope

This method is used for the determination of ammonia nitrogen in drinking water, ground water, surface water, and domestic and industrial wastes according to USEPA Method 350.1 and Standard Methods 4500–NH_3 H. This method can also be used for the determination of ammonia nitrogen in potassium chloride (KCl) extracts of soils and plants.

Summary

Ammonia reacts with alkaline phenol and hypochlorite to form indophenol blue in an amount that is proportional to the ammonia concentration. Sodium nitroferricyanide intensifies the blue color. Measure the absorbance at 640 nm. Distillation is required for regulatory compliance.

Interferences

Cyanate, which may be encountered in certain industrial effluents, hydrolyzes to some extent, even at the pH of 9.5 at which distillation is carried out. Eliminate precipitation of calcium and magnesium hydroxides by adding ethylenediaminetetraacetic acid (EDTA). Filter turbid samples prior to analysis. Samples with background absorbance at the analytical wavelength may interfere. Color intensity is sensitive to pH; standardize samples at pH 5–7 prior to analysis. Samples containing high concentrations of chlorine must be pretreated prior to analysis with sodium thiosulfate or other dechlorinating reagents.

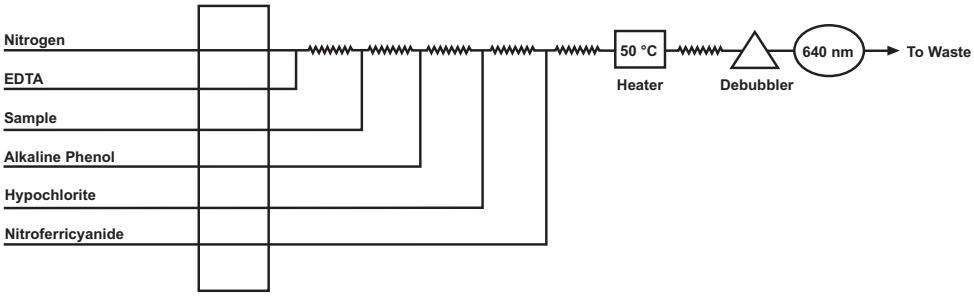
Performance Specifications

Range:	0.01–25 mg/L
Throughput:	72 samples/hour
Precision (at 0.1 mg/L):	<1% RSD
Precision (at 1.0 mg/L):	<2% RSD
Precision (at 10 mg/L):	<5% RSD
Method Detection Limit (MDL):	0.003 mg/L
Accuracy:	97.89%

Chemicals

- Ammonium Sulfate, $(NH_4)_2SO_4$
- Brij®-35, 21% solution (part number A21-0110-33)
- Chloroform, $CHCl_3$
- Deionized (DI) Water, ASTM Type I or II
- Ethylenediaminetetraacetic Acid, disodium salt dihydrate (EDTA), $C_{10}H_{16}N_2Na_2O_8 \bullet 2H_2O$
- Phenol, solid or liquefied, 88%, C_6H_5OH
- Sodium Hydroxide, NaOH
- Sodium Hypochlorite, 5.25% available chlorine, NaOCl
- Sodium Nitroferricyanide Dihydrate, $Na_2Fe(CN)_5NO \bullet 2H_2O$
- Sodium Thiosulfate, $Na_2S_2O_3$
- Sodium Tetraborate Decahydrate, $Na_2B_4O_7 \bullet 10H_2O$
- Sulfuric Acid, concentrated, H_2SO_4

Basic Flow Diagram



Selected Reference

Methods for the Determination of Inorganic Substances in Environmental Samples; EPA/600/R-93/100; U.S. Environmental Protection Agency, Office of Research and Development, Environmental Monitoring and Support Laboratory: Cincinnati, OH, 1993; Method 350.1.

Standard Methods for the Examination of Water and Wastewater, 21st ed.; American Public Health Association: Washington, D.C., 2005.

Figures

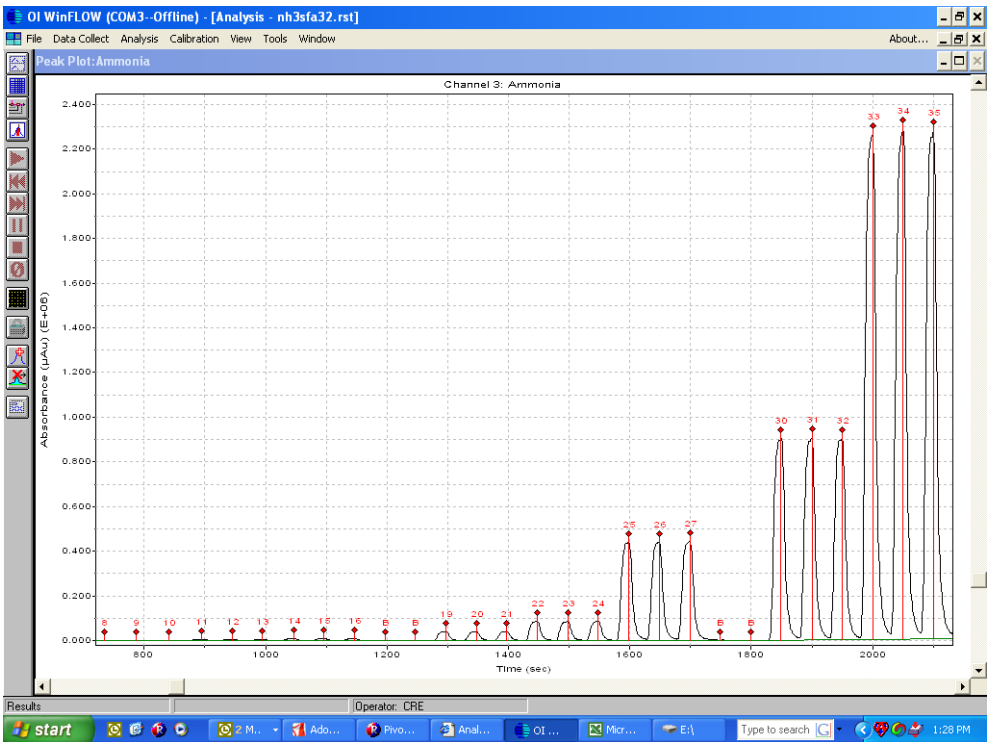


Figure 1. Ammonia Nitrogen Calibration (0.01–25 ppm)

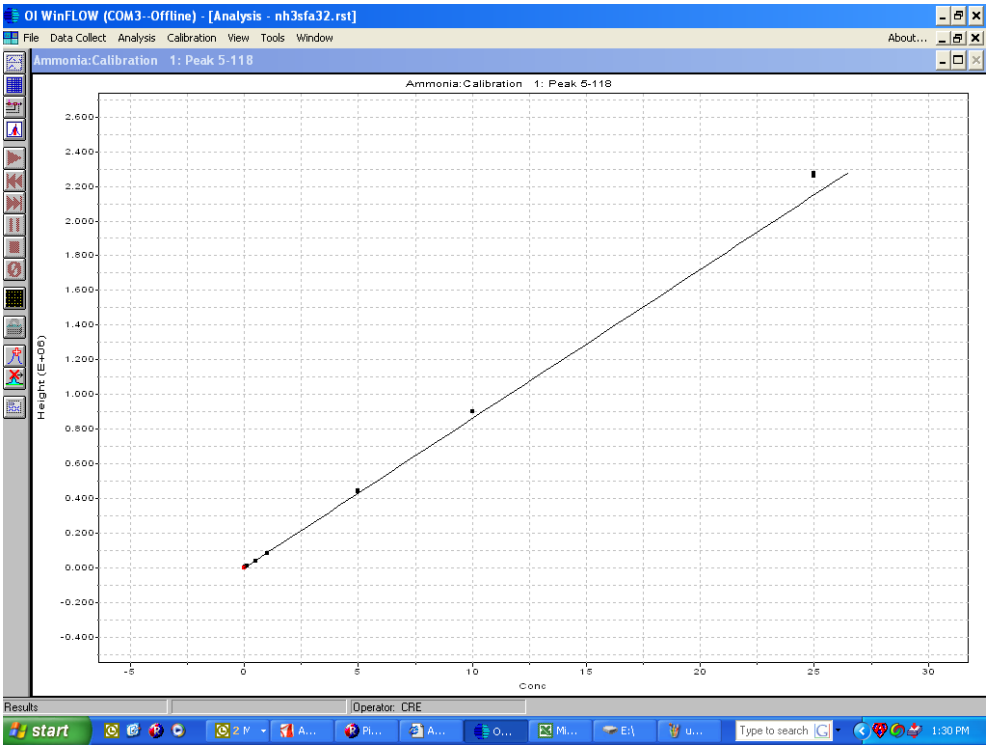


Figure 2. Ammonia Nitrogen Calibration Curve (0.01–25 ppm)

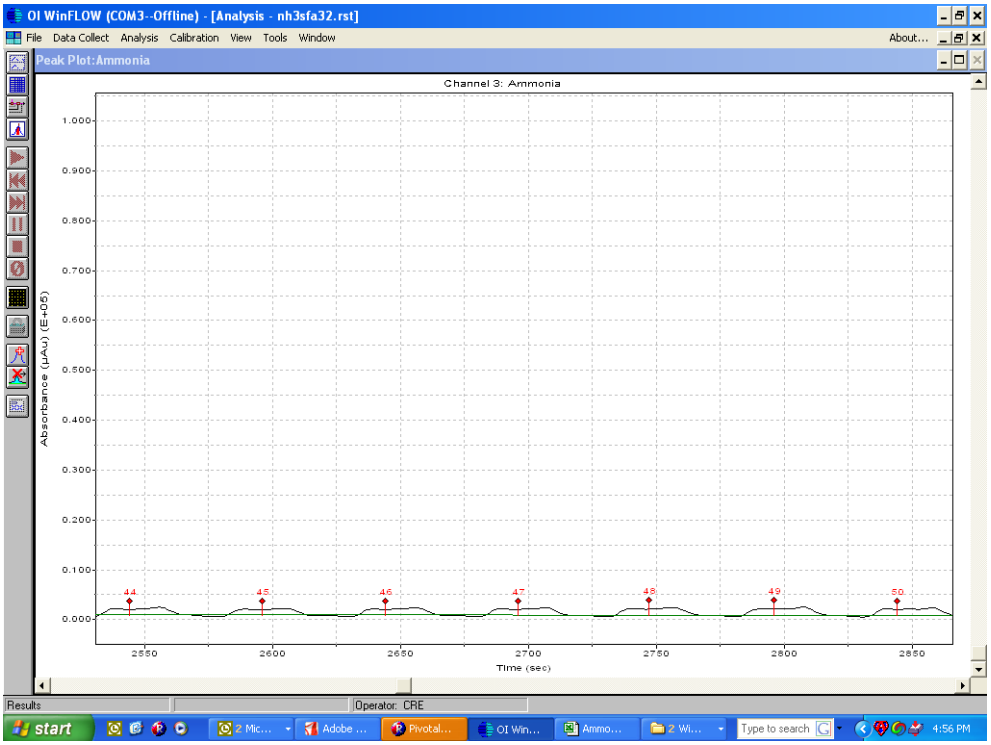


Figure 3. Ammonia Nitrogen Method Detection Limit (at 0.01 ppm)

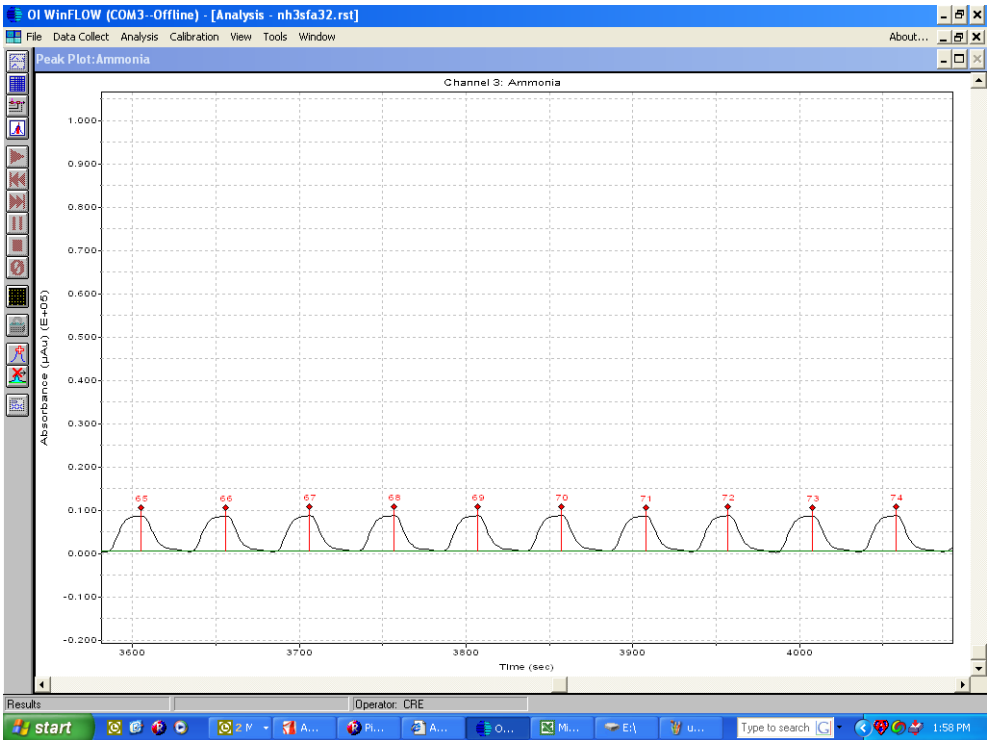


Figure 4. Ammonia Nitrogen Precision (at 0.10 ppm)

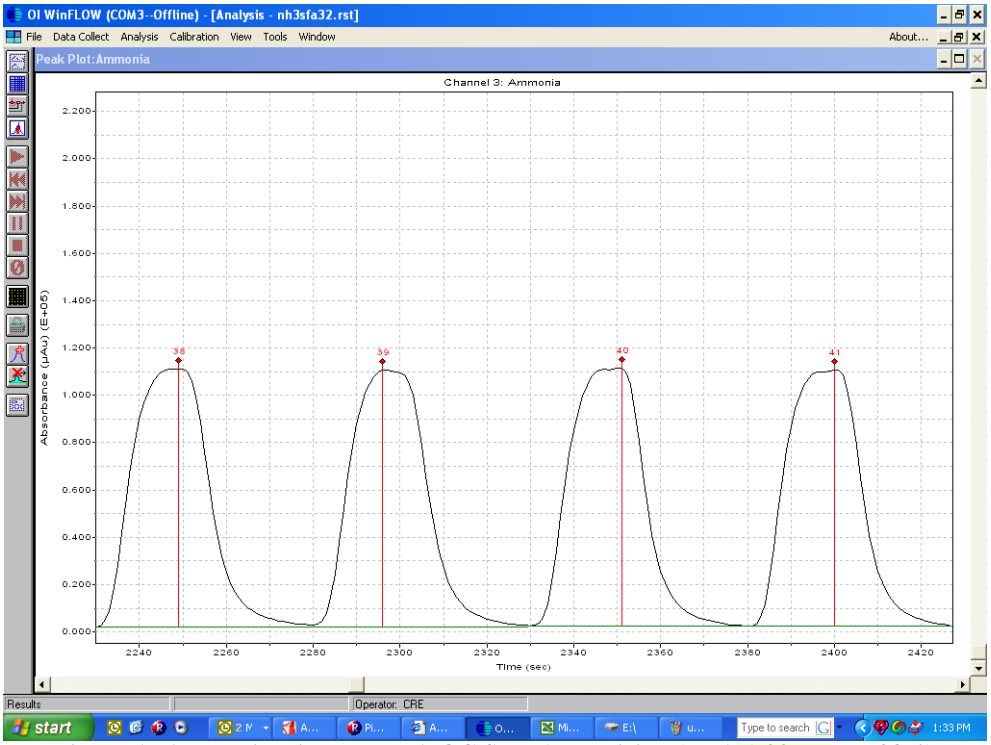


Figure 5. Ammonia Nitrogen ERA QC Sample Precision (ERA 1.29 ppm at 98%)

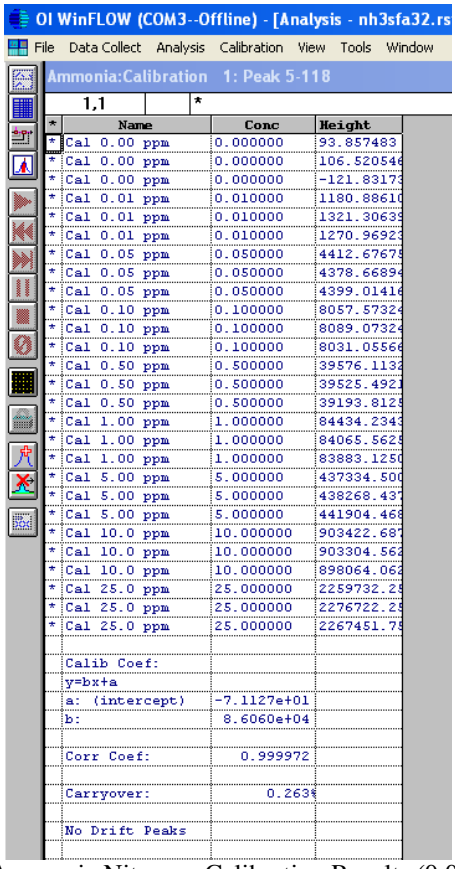


Figure 6. Ammonia Nitrogen Calibration Results (0.01–25 ppm)

Table 1. Ammonia Nitrogen Method Data

Parameter	Calibrant 0.01 mg/L	Calibrant 0.1 mg/L	Calibrant 1.0 mg/L	Calibrant 10.0 mg/L	ERA QC Standard 1.29 mg/L
Rep 1	0.01379	0.09543	0.09777	10.43	1.2682
Rep 2	0.01365	0.09466	0.09384	10.44	1.2578
Rep 3	0.01441	0.09624	0.09805	10.43	1.2690
Rep 4	0.01453	0.09675	0.09915	10.34	0.2593
Rep 5	0.01532	0.09618	0.09724	10.42	—
Rep 6	0.01564	0.09664	0.09788	10.45	—
Rep 7	0.01527	0.09515	0.09746	10.43	—
Rep 8	—	0.09594	0.09883	10.35	—
Rep 9	—	0.09533	0.09787	10.50	—
Rep 10	—	0.09619	0.09908	10.47	—
Average	0.01466	0.09585	0.9772	10.43	4.559
Standard Deviation	0.0007751	0.0006457	0.01436	0.04494	0.005859
% RSD	5.29	0.67	1.47	0.43	0.46
MDL	0.0024	—	—	—	—
% Accuracy	—	—	—	—	97.89%