Standard Operating Procedure for the Determination of Color by Color Kit CCAL 15A.1

Cooperative Chemical Analytical Laboratory
College of Forestry
Oregon State University
321 Richardson Hall
Corvallis, Oregon

Prepared by Jeremy Unrau and Kathryn Motter
Revised February 2015

Standard Operating Procedure for the Determination of Color by Color Kit CCAL 15A.1

Table of Contents

Standard Operating Procedure for the Determination of Color by Color Kit CCAL 15A.1

1.0 Scope and Application

1.1 This method is used to measure color in fresh waters and may indicate the presence of metallic and natural organic matter in samples. Application range of this method is 0-100 Platinum Cobalt color units.

2.0 Summary of Method

2.1 Color is determined by visual comparison of a sample with an APHA Platinum Cobalt Color Disc. The standard unit of color is defined as that produced by 1 mg/L platinum in the form of the chloroplatinate ion. This method is useful for determination of color due to naturally occurring materials, but is not applicable to most highly colored industrial wastewaters. True color is defined as color from a filtered sample, in which turbidity and suspended matter has been removed. Apparent color is that of an untreated sample and includes color due to substances in solution as well as suspended material.

3.0 Definitions

3.1 DI water: Water that has been through a deionization system to produce water similar to ASTM Type I reagent with 16.7 Mohms resistivity (ASTM) (Reference 16.2).

4.0 Interferences

4.1 Turbidity results in high color values, and must be removed by filtration for determination of true color.

4.2 Color is extremely pH dependent and increases with increasing pH. The pH of the sample at time of analysis should be reported with color data.

5.0 Safety

5.1 The toxicity or carcinogenicity of each reagent has not been precisely determined; however, each chemical should be regarded as a potential health hazard. Exposure to these chemicals should be reduced to the lowest possible level. Cautions are included for known extremely hazardous materials.

5.1.1 Hydrochloric acid
5.1.2 Cobalt(II) chloride hexahydrate
5.1.3 Potassium hexachloroplatinate

6.0 Equipment and Supplies

Note: *Brand names, suppliers and part numbers are for illustrative purposes only. No endorsement is implied. Equivalent performance may be achieved using apparatus and materials other than those specified here, but demonstration of equivalent performance that meets the requirements of this method is the responsibility of the laboratory.*

6.1 HACH Color Test Kit – color comparator, color disc (0-100 units), 2X color viewing tubes with 15mL mark, lengthwise viewing adapter

6.2 Filtration system - filter funnel, filter stage, filter barrel, clamps, erlenmeyer filter flask

6.3 GF/F or GF/C filter papers

6.5 Vacuum system and connecting hoses

6.6 Lab Coat

6.7 Gloves

6.8 Safety Glasses

7.0 Reagents and Standards

7.1 Preparation of Standards

7.1.1 *Potassium chloroplatinate standard stock solution*:
Dissolve 1.246 g of potassium chloroplatinate (K_2PtCl_6; equivalent to 500 mg of metallic platinum) and 1.00 g crystallized cobaltous

chloride ($CoCl_2 \cdot 6H_2O$; equivalent of approximately 250 mg of metallic cobalt) in approximately 600 mL of DI water with 100 mL concentrated hydrochloric acid in a 1 L volumetric. Dilute to volume with DI water. Stock standard concentration is 500 CU (color units). Prepare fresh annually or as needed.

7.1.2 *Potassium chloroplatinate working standards:*

Volume of Stock Standard (mL)	Final Volume (mL)	Final Concentration (CU)
2.5	50	25
5.0	50	50
7.0	50	70

Standards are stored at 4°C.

8.0 Sample Handling and Storage

8.1 Unfiltered samples are filtered upon receipt through glass fiber filters into clean HDPE bottles and stored at 4°C in the dark. Samples are analyzed within 48 hours to ensure sample integrity. If samples must be held prior to analysis, they are stored frozen at -18ºC.

8.2 Unfiltered samples to be analyzed for apparent color are stored at 4°C in the dark.

9.0 Quality Control

9.1 Standards of a known concentration are prepared and analyzed against the color wheel to ensure an accurate and consistent reading.

9.2 Color comparison for each sample is determined three times, and the results averaged.

10.0 Calibration and Standardization

10.1 Balances: calibrated yearly by external vendor.

10.2 Pipette delivery is checked by weight to within 1% of theoretical weight of aliquot volume.

11.0 Procedure

11.1 Sample Preparation and Analysis
(Reference 16.3)

11.1.1 Insert the lengthwise viewing adapter into the sample comparator.
11.1.2 Fill one sample tube with approximately 15mL of sample, to the line underling “Car. 1730-00”.
11.1.3 Place the sample tube into the comparator opening located towards the center.
11.1.4 Fill the other sample tube with DIW and place into the opening located on the left side of the comparator.
11.1.5 Hold the comparator one foot away from your face with the tube tops pointing vertically towards a light source. View through the openings in the front of the comparator against a smooth white background.
11.1.6 Rotate the disc until a color match is obtained. The reading obtained through the scale window is the apparent color in APHA Platinum Cobalt Units. Record reading to the nearest whole number. Note as true color for filtered samples, and apparent color for unfiltered samples.
11.1.7 For high range samples, remove lengthwise viewing adapter and fill tubes to 5mL mark. Readings are multiplied by 5 to obtain color in APHA Platinum Cobalt Units.

11.2 Procedural Notes

11.2.1 Samples should be allowed to come to room temperature before analysis.

12.0 Data Analysis and Calculations

12.1 Correction for high range sample

Color (CU) = A x 5

where A = color reading of the sample in CU

12.2 Report results to the nearest whole number

13.0 Method Performance

13.1 This method was validated through inter-laboratory studies. The CCAL Water Analysis Laboratory participates in the National Water Research Institute's (NWRI) Environment Canada Proficiency Testing (PT) Program.

14.0 Pollution Prevention

14.1 The chemicals used in this method pose little threat to the environment when properly managed.

14.2 All standards and reagents should be prepared in volumes consistent with laboratory use to minimize the volume of disposable waste.

14.3 For further information on pollution prevention consult *Less is better: Laboratory Chemical Management for Waste Reduction*, available from the American Chemical Society's Department of Government Relations and Science Policy, 1155 16th Street NW, Washington D.C. 20036, (202) 872-4477.

15.0 Waste Management

15.1 It is the laboratory's responsibility to comply with all federal, state and local regulations governing waste management, and to protect the environment by minimizing and controlling all releases from fume hoods and bench operations. Compliance with all sewage discharge permits and regulations is required.

15.2 For further information on waste management, consult "The Waste Management Manual for Laboratory Personnel", and "Less is Better: Laboratory Chemical Management for Waste Reduction", both available from the American Chemical Society's Department of Government Relations and Science Policy, 1155 16th Street NW, Washington DC, 20036.

16.0 References

16.1 Standard Methods For The Examination of Water and Wastewater, Method 2120 – Color, Visual Comparison Method. American Public Health Association. 21st Edition, 2005.

16.2 ASTM. American Society for Testing and Materials. Standard Specifications for Reagent Water. D1193-77 (Reapproved 1983). Annual Book of ASTM Standards, Vol. 11.01. ASTM: Philadelphia, PA, 1991.

16.3 HACH Model CO-1 Color Test Kit User's manual. HACH Company; Loveland, Colorado.

17.0 Tables, Diagrams, Flowcharts, and Validation Data

17.1 Color Analysis Results

Color Wheel Data Summary

Project: _____ Date:_____ Analyst: _____

Sample Volume (mL): _____ Standard Range: S1:_____ S2:_____ S3:_____.

Remarks: _____

Sample #	pH	Filtered / Unfiltered	Reading #			Average Reading (CU)	Comments
			1 (CU)	2 (CU)	3 (CU)		
Blank		-					
S1		-					
S2		-					
S3		-					

18.0 Document Revision History

Original Document: January 2010
Version: 15A.0
Title: Standard Operating Procedure for the Determination of Color by Color Kit

Edit Date: February 2015
New Version: 15A.1
General editing throughout