Chemical Coagulation

Introduction

Chemical coagulation is an important process in water treatment that helps produce clear, finished water which is aesthetically acceptable to the consumer. Much of the suspended matter in water is colloidal (1 mm to 1 m) and negatively charged. Because of their large surface area and electrical charge, colloidal particles settle very slowly. Aluminum or iron salts are utilized to neutralize these surface charges and to cause the colloids to coalesce and become large enough so that they will readily settle.

Chemical coagulation tests are necessary to determine the best coagulants, coagulant aids, optimum dosages, and optimum pH needed to accomplish the desired treatment.

Experimental Procedure

A. Measure the turbidity of the water

B. For the first set of jar tests, use the following dosages:

Group 1

Jar	1	2	3	4	5	6
Dosage, mg/L	10	20	30	40	50	60
mL of stock	1	2	3	4	5	6

Group 2

Jar	7	8	9	10	11	12
Dosage, mg/L	70	80	90	100	110	120
mL of stock	7	8	9	10	11	12

Perform the jar test procedure and determine the best dosage based on your observations and by analyzing the supernatant for turbidity.

C. Repeat the jar test using a different range of dosages. Consider narrowing or extending the range of dosages used in the first round of jar test. Analyze the supernatant for turbidity.

Analysis of Results

A. Discuss your results and draw conclusions about the treatability of the water source to make it suitable for domestic use.

B. Plot the supernatant turbidity (NTU) verse the coagulant dosage.

C. Determine the *best* dosage of coagulant from your observations and measurements.

D. Using the dosage found in Part C, calculate the quantity (lbs) of the coagulant needed to treat 10 million gallons per day (MGD).

Jar Test Procedure

1. Prepare 12 two-liter samples.
2. Clean the stirring paddles.
3. Place all beakers on the stirring apparatus.
4. With a pipette, add the prescribed dosages of coagulant.
5. Rapid mix the solution at 300 rpm for 1 minute.
6. Reduce stirring speed to 30 rpm and flocculate for 5 minutes.
7. Record turbidity.
8. Allow the solution to settle for 15, 30, and 45 minutes. At the end of each 15 minute period, measure and record the turbidity of the supernatant.
9. Describe results as poor, fair, good, or excellent and determine the optimum dosage.

Note: Use Hach 2100N to determine turbidity