Chromium Cr(VI)

Equipment and reagents

- Conical flask
- Measuring cylinder
- Burette with sodium thiosulfate, 1/40 molar solution ($Na_2S_2O_3$)
- Potassium iodide, 10% solution (KJ)
- Sulfuric acid solution (H_2SO_4)
- Starch indicator

Method

- Pour into the flask:
  sample of raw wastewater: 20 mL of raw chromic wastewater and 30 mL of distillated water (prepare 2 samples)
  sample after treatment: 50 mL of treated chromic wastewater
- Add 10 mL of KJ.
- Add 1 mL of H_2SO_4.
- Close the flask with a cork, mix the sample and then place the sample into a dark place for 5 min.
- After that, titrate the sample with $Na_2S_2O_3$ solution to a light yellow colour, then add 5 mL of starch indicator and continue the titration until the blue colour disappears.
- The amount of $Na_2S_2O_3$ used for titration before and after starch mark as "a".

Calculations

$$Cr^{+6} = \frac{a \cdot 0.433 \cdot 1000}{V}\ , \text{mg/L}$$

where:
a – the amount of $Na_2S_2O_3$ used for titration before and after starch, mL
0.433 – conversion factor: 1 mL of 1/40 molar solution of $Na_2S_2O_3$ corresponds to 0.433 mg of Cr(VI)
1000 – conversion factor: mL to L
V – volume of wastewater sample, mL

Sodium sulfite Na_2SO_3 (before treatment)

Equipment and reagents

- Conical flask
- Measuring cylinder
- Burette with sodium thiosulfate, 1/40 molar solution ($Na_2S_2O_3$)
- Iodine, 1/40 molar solution (I_2)
- Glacial acetic acid (CH_3COOH)
- Sodium sulfite solution (Na_2SO_3) – as a reducer
- Starch indicator

Method

- Prepare two flasks, mark them as *sample 1* and *sample 2*.
- Pour 50 mL of I_2 into each flask.
- Add 5 mL of CH_3COOH and mix.
- Then add 2 mL of Na_2SO_3 into *sample 1* and 3 mL of Na_2SO_3 into *sample 2*.
- Mix the samples and place them into a dark place for 2 min.
- After that, titrate each sample with $Na_2S_2O_3$ solution to a light yellow colour, then add 5 mL of starch indicator and continue the titration until the blue colour disappears.
- The amount of $Na_2S_2O_3$ used for titration before and after starch mark as "a".

Calculations

$$Na_2SO_3 = \frac{(50-a)\cdot 1.575\cdot 1000}{V}, \text{ mg/L}$$

where:
a – the amount of $Na_2S_2O_3$ used for titration before and after starch, mL
1.575 – conversion factor: 1 mL of 1/40 molar solution of $Na_2S_2O_3$ corresponds to 1.575 mg of Na_2SO_3
1000 – conversion factor: mL to L
V – volume of reducer used for each sample preparation, mL

Sodium sulfite Na_2SO_3 (after treatment)

Equipment and reagents

- Conical flask
- Measuring cylinder
- Burette with sodium thiosulfate, 1/40 molar solution ($Na_2S_2O_3$)
- Iodine, 1/40 molar solution (I_2)
- Glacial acetic acid (CH_3COOH)
- Starch indicator

Method

- Pour 10 mL of I_2 into the flask.
- Add 5 mL of CH_3COOH and mix.
- Add 20 mL of treated chromic wastewater.
- Mix the sample and then place it into a dark place for 2 min.
- After that, titrate the sample with $Na_2S_2O_3$ solution to a light yellow colour, then add 5 mL of starch indicator and continue the titration until the blue colour disappears.
- The amount of $Na_2S_2O_3$ used for titration before and after starch mark as "a".

Calculations

$$Na_2SO_3 = \frac{(50-a)\cdot 1.575\cdot 1000}{V}, \text{ mg/L}$$

where:
a – the amount of $Na_2S_2O_3$ used for titration before and after starch, mL
1.575 – conversion factor: 1 mL of 1/40 molar solution of $Na_2S_2O_3$ corresponds to 1.575 mg of Na_2SO_3

1000 – conversion factor: mL to L
V – volume of treatment wastewater used for sample preparation, mL

Solids

Total Solids (TS) = Total Suspended Solids (TSS) + Total Dissolved Solid (TDS)

Equipment

- Graduated cylinder
- Evaporating dishes
- Filter papers
- Funnel
- Analytical balance
- Water bath
- Drying oven

Total solids (TS)

Method

- Weigh an empty evaporating dish; record the mass as "a".
- Using the cylinder measure 50 mL of well-mixed wastewater sample and pour it into the pre-weighed dish.
- Evaporate the sample to dryness on a water bath.
- Next place the evaporating dish in the drying oven and dry the sample at 105°C for 24h.
- Cool the dish in a desiccator to balance the temperature.
- Using the analytical balance weigh the evaporating dish with the dried deposit; record the mass as "b".

Calculations

$$TS, mg/L = \frac{(b-a)\cdot 1000}{V}$$

where:
a – mass of empty evaporating dish, mg
b – mass of evaporating dish with dried deposit, mg
V – volume of sample, mL

Total Dissolved Solid (TDS)

Method

- Weigh an empty evaporating dish; record the mass as "a".
- Filter a well-mixed wastewater sample using a funnel and filter paper.
- Using a graduated cylinder measure 50 mL of filtrate and pour it into the pre-weighed dish.
- Evaporate the sample to dryness on a water bath.