

Determination of the Activity of Aqueous Bromine-Containing Solutions By Iodometric Titration

Background

Under acidic conditions, the active ingredient in aqueous bromine-containing solutions quantitatively liberates iodine from excess potassium iodide. The iodine is titrated with a standard solution of sodium thiosulfate, and a starch indicator is introduced near the end-point. The volume of titrant required is used to calculate the activity of the bromine-containing solution.

Apparatus

Digital burette capable of dispensing in single increments of 0.01 ml with accuracy +/- 0.2%

Erlenmeyer flask (125 ml)

Magnetic stirrer and stir bar

Analytical balance capable of reading 0.001 g

Reagents

De-ionized or reverse osmosis water

Potassium iodide crystals, ACS

Glacial acetic acid, trace-grade 99.7% min.

0.100N sodium thiosulfate, Na₂S₂O₃ *

Starch indicator solution, 1% w/v, for iodometric titrations

Procedure

- (1) Accurately weigh (4 decimal places) approximately 0.2 g of aqueous bromine-containing solution to a 125 ml Erlenmeyer flask.
- (2) Dilute with 50 ml de-ionized or reverse osmosis water and add a magnetic stir bar.
- (3) Add 5 ml glacial acetic acid and 1 g potassium iodide
- (4) With stirring, titrate the liberated iodine with 0.100N sodium thiosulfate (Na₂S₂O₃) until the solution turns a faint straw color.
- (5) Add 1 ml of starch indicator solution, and add the titrant dropwise to discharge the blue coloration. Record the volume (V_A/ml).
- (6) Perform a blank determination by repeating steps (2)-(5). Record the volume (V_B). Note that V_B may be zero.

Calculation

To express the results as weight % available Cl₂ use:

$$\text{Wt \% available Cl}_2 = \frac{(V_A - V_B)/\text{ml} \times N \text{ Na}_2\text{S}_2\text{O}_3 \times 0.03545 \times 100}{\text{Wt. of sample/g}}$$

* The 0.1 N sodium thiosulfate must be standardized using ASTM or ACS procedures.