

Experiment Measurement of COD (simplified assay)

Purpose

The biggest cause to pollute a river is household effluent. So, the purpose of this experiment is measuring COD of soy sauce, milk and orange juice which we throw into a sink directly.

Principle

COD (Chemical Oxygen Demand) is a measurement of the oxygen required to oxidize soluble and particulate organic matter in water.

The method involves using a strong oxidizing chemical, potassium permanganate KMnO_4 , to oxidize the organic matter in solution to carbon dioxide and water under acidic conditions. The amount of oxygen required is calculated from the quantity of KMnO_4 (chemical oxidant) consumed.

Preparation

- Conical beaker (100 mL×3) Magnetic stirrer Stir bar Pipette (2 mL)
 Graduated cylinder (50 mL) 0.01 mol/L potassium permanganate (KMnO_4) solution
 3 mol/L sulfuric acid (H_2SO_4) solution Distilled water River water
 Soy sauce (1,000 times diluted) Milk (1,000 times diluted) Orange juice (1,000 times diluted)

Procedure

- Put a stir bar into a conical beaker.
- Put 50 mL distilled water into the conical beaker with a graduated cylinder.
- Put 2 mL sulfuric acid into the conical beaker with a pipette.
- Put the conical beaker on a magnetic stirrer.
- Drop a drop of a potassium permanganate solution with a pipet under agitation (if the rotary speed of the stirring bar is too fast, this situation is dangerous because solution splashes.) and confirm a color.
 ※This color (light purple-red) is standard when you determine whether the reaction is finished.
- Drop a potassium permanganate solution drop by drop after having operated procedure 1 and 2 about river water, the soy sauce or milk or orange juice. When a color of potassium permanganate which I confirmed in procedure 5 (light purple-red), even if the terminal waits for 30 seconds does not disappear, record the number of drops.

※Be careful about sulfuric acid and potassium permanganate.

Result

Sample	River water	Soy sauce (1,000 times diluted)	Milk (1,000 times diluted)	Orange juice (1,000 times diluted)
Number of Drops				

Conclusion

Sample	River water	Soy sauce (1,000 times diluted)	Milk (1,000 times diluted)	Orange juice (1,000 times diluted)
COD [mg/L=ppm]				

1 drop of KMnO_4 aq = 0.04 mL, Ratio of amount of substance KMnO_4 :O=2:5, atomic weight O=16
 Chemical reaction of conversion : $2\text{KMnO}_4 + 3\text{H}_2\text{SO}_4 \longrightarrow \text{K}_2\text{SO}_4 + 2\text{MnSO}_4 + 3\text{H}_2\text{O} + 5\text{O}$