

Cobalt Complex Equilibrium

Temperature and Concentration Effects:

Purpose

To demonstrate the shift in equilibrium caused by a change of temperature and a change in concentration.

Materials

0.4 M CoCl ₂ (5.2g/100 mL H ₂ O)	hot plate
0.2 M CoCl ₂ (2.6g/100 mL H ₂ O)	ice bath
0.1 M AgNO ₃ (1.7g/100 mL H ₂ O)	2 Deep Petri dishes
concentrated. HCl	distilled water
250 mL beaker	dropper (2)
100 mL beakers (4)	

Procedure

Temperature effects

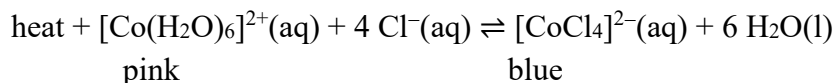
- I. Place 100 mL 0.4 M CoCl₂ in 250 mL beaker
- II. Heat the solution in a flask until it turns blue.
- III. Fill a large test tube with the blue solution.
- IV. Immerse lower half of tube in an ice-salt bath (-18 C).
- V. Note the bottom half of solution turns pink.

Concentration Effects

1. Place 20 mL 0.2 M CoCl₂ in 100 mL beaker. Add 40 mL conc HCl. Note blue color.
2. Place 2 Deep Petri dishes on overhead projector. Add CoCl₂ solution from 1 to each.
 - a. To Petri #1 add distilled water until color changes to clear.
 - b. To Petri #2 add AgNO₃ drop wise until precipitate forms.
Note pink color of solution.

Additional Information

1. The equilibrium is



2. Temperature effects
 - a. Heat causes shift in equilibrium to products
 - b. Cooling shifts equilibrium to reactants
3. Concentration effects
 - a. Excess Cl^- causes formation of a more blue complex (tetrachlorocobalt (II))
 - b. excess H_2O shifts equilibrium to pink complex (hexaaquocobalt (II))
 - c. Silver nitrate removes Cl^- (forming Ag Cl) causing equilibrium to shift toward the pink complex.

Disposal

Solutions should be placed in properly labeled waste container with UI# 96482.

Reference

Summerlin and Ealey, Chemical Demonstrations