

16.5 Lewis Acid/Base reaction (Ammonia + Copper Chloride)

Subjects: Acids/Bases, Lewis Acid-base reactions, complex ions, equilibrium, Le Chatlier's principle

Description: Ammonia is added to a solution containing copper chloride, producing the deep blue adduct. When acid is added, the reaction is reversed.

Materials:

500 mL tall form beaker

Glass stir rod

1M Copper chloride (CuCl₂)[‡]

1 M Aqueous Ammonia[‡]

1 M Hydrochloric acid (HCl)[‡]

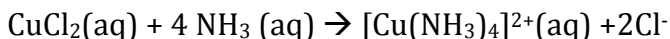
[‡]HCl and Ammonia are located in the cabinets under the hood. Copper chloride is located in the chemical storage cabinets.

Procedure:

1. Add copper chloride solution to the beaker.
1. Add some ammonia to the copper chloride solution. The solution will turn a deep blue.
2. Add the acid. The reaction is reversed.

Discussion:

A Lewis acid is a substance that can accept a pair of electrons, while a Lewis Base can donate a pair of electrons. Lewis acid/base reactions produce an acid-base adduct, with coordinate covalent bonds. Ammonia is a good example of a Lewis Base. It has one lone pair of electrons to donate. Metal cations can act as Lewis acids. Thus the reaction between copper (II) and ammonia is a Lewis acid-base reaction that produces a colorful complex ion with four ammonia molecules surrounding the central copper ion. The reaction is shown below:



When an acid is added, the ammonia is protonated and the reaction is reversed.

Disposal: Make sure the solution is within the proper pH range. The solution can be flushed down the drain with water.

References:

1. Prof. Rotondi