| COMPONENTS: | ORIGINAL MEASUREMENTS: |
|---|---|
| (1) Copper(II) oxide; CuO; [1317-38-0]<br>(2) Potassium fluoride; KF; [7789-23-3]<br>(3) Hydrofluoric acid; HF; [7664-39-3]<br>(4) Water; $H_2O$; [7732-18-5] | Jaeger, A. *Z. Anorg. Allg. Chem.* 1901, *27*, 22-40. |
| **VARIABLES:**<br>Concentration of HF at 25°C | **PREPARED BY:**<br>T. P. Dirkse |

**EXPERIMENTAL VALUES:**

Solubility of CuO in aqueous HF at 25°C

| $C_{KF}$/mol dm$^{-3}$ | $C_{HF}$/mol dm$^{-3}$ | $C_{Cu}$/mol dm$^{-3}$ |
|---|---|---|
| 0 | 0.12 | 0.0307 |
| 0 | 0.28 | 0.1164 |
| 0 | 0.57 | 0.2494 |
| 0 | 1.08 | 0.388 |
| 0 | 2.28 | 0.463 |
| 0.41 | 0.12 | 0.0356 |
| 0.41 | 0.28 | 0.06437 |
| 0.41 | 0.57 | 0.1442 |
| 0.41 | 1.11 | 0.2451 |
| 0.41 | 2.17 | 0.2517 |

The author suggests that the decrease in solubility of CuO in HF when KF is added may be due to the following reaction:

$$HF + KF = KHF_2.$$

**AUXILIARY INFORMATION**

| METHOD/APPARATUS/PROCEDURE: | SOURCE AND PURITY OF MATERIALS: |
|---|---|
| An equivalent amount of CuO was added to 48 ml of solvent. The mixture was shaken in a thermostat at 25°C. There is no indication about the length of time the mixtures were shaken. The copper content was determined by electrolytic deposition. | The HF solutions were prepared by dilution of a redistilled chemically pure aqueous solution of HF. Nothing is said about the other materials that were used. |
| | **ESTIMATED ERROR:**<br>No indication is given. The solubility values are listed as the "maximum values". |
| | **REFERENCES:** |

| COMPONENTS: | ORIGINAL MEASUREMENTS: |
|---|---|
| (1) Copper(II) hydroxide; $Cu(OH)_2$; [20427-59-2]<br>(2) Ammonium hydroxide; $NH_4OH$; [1336-21-6]<br>(3) Ammonium sulfate; $(NH_4)_2SO_4$; [7783-20-2]<br>(4) Sodium sulfate; $Na_2SO_4$; [7757-82-6]<br>(5) Water; $H_2O$; [7732-18-5] | Dawson, H. M. *J. Chem. Soc.* 1908, *95*, 370-81. |
| **VARIABLES:**<br>Composition of the solvent at 18°C. | **PREPARED BY:**<br>T. P. Dirkse |

**EXPERIMENTAL VALUES:**

Solubility of $Cu(OH)_2$ in ammoniacal ammonium sulfate solutions at 18°C.[a]

| $C_{NH_3}$/mol dm$^{-3}$ | $C_{(NH_4)_2SO_4}$/mol dm$^{-3}$ 0 | 0.01 | 0.025 | 0.05 | 0.1 | 0.2 | 0.4 |
|---|---|---|---|---|---|---|---|
| 0 | - - - | - - - - | - - - | 0.0004[b] | - - - | 0.0157[b] | 0.0180[b] |
| 0.05 | - - - | 0.00129 | 0.00511 | 0.0130[b] | 0.0215[b] | 0.0325[b] | 0.0579[b] |
| 0.1 | - - - | 0.00326 | 0.0108 | 0.0233 | 0.0411[b] | - - - - | - - - - |
| 0.2 | 0.00054 | 0.00649 | 0.0175 | 0.0384 | 0.0690 | 0.1027[b] | 0.1397[b] |
| 0.5 | 0.0033 | 0.0127 | 0.0284 | 0.0536 | 0.1013 | 0.1844 | 0.2805[b] |
| 1.0 | 0.0109 | 0.0210 | 0.0386 | 0.0660 | 0.1185 | 0.2275 | 0.4135 |
| 2.0 | 0.0314 | 0.0462 | 0.0605 | 0.0886 | 0.1468 | 0.2591 | 0.4718 |
| 3.0 | 0.0548 | 0.0672 | 0.0847 | 0.1156 | 0.1740 | 0.2861 | 0.5044 |
| 4.0 | 0.0784 | 0.0922 | 0.1101 | 0.1397 | 0.2002 | 0.3188 | 0.5451 |
| 5.0 | 0.1041 | 0.1154 | 0.1320 | 0.1639 | 1.2239 | 0.3415 | 0.5615 |

[a] The numbers in the columns represent the concentration of copper as mol dm$^{-3}$.

[b] The author doubts that these values correspond to any definite equilibrium condition.

Solubility of $Cu(OH)_2$ in ammoniacal sodium sulfate solutions at 18°C.

| $C_{NH_3}$/mol dm$^{-3}$ | $C_{Na_2SO_4}$/mol dm$^{-3}$ | $C_{Cu}$/mol dm$^{-3}$ |
|---|---|---|
| 1 | 0 | 0.0109 |
| 1 | 0.025 | 0.0134 |
| 1 | 0.1 | 0.0162 |
| 1 | 0.2 | 0.0192 |

**AUXILIARY INFORMATION**

| METHOD/APPARATUS/PROCEDURE: | SOURCE AND PURITY OF MATERIALS: |
|---|---|
| No information is given about the preparation of the saturated solutions or how the analysis for copper content was carried out. | Crystalline $Cu(OH)_2$ was prepared by adding $NH_4OH$ to aqueous $CuSO_4$, washing the precipitate, and drying it in a vacuum over $H_2SO_4$. The $NH_4OH$ was prepared by distilling aqueous $NH_4OH$ to which NaOH had been added and collecting the $NH_3$ vapor in conductivity water. The $(NH_4)_2SO_4$ was purified by repeated crystallization. |
| | **ESTIMATED ERROR:**<br>No information is given. |
| | **REFERENCES:** |

| COMPONENTS: | ORIGINAL MEASUREMENTS: |
|---|---|
| (1) Copper(II) hydroxide; $Cu(OH)_2$; [20427-59-2]<br>(2) Ammonium hydroxide; $NH_4OH$; [1336-21-6]<br>(3) Barium hydroxide; $Ba(OH)_2$; [17194-00-2]<br>(4) Sodium hydroxide; NaOH [1310-73-2]<br>(5) Water; $H_2O$; [7732-18-5] | Dawson, H. M. *J. Chem. Soc.* 1908, *95*, 370-81. |
| **VARIABLES:**<br>Composition of the solvent at 18°C. | **PREPARED BY:**<br>T. P. Dirkse |

**EXPERIMENTAL VALUES:**

Solubility of $Cu(OH)_2$ in ammoniacal $Ba(OH)_2$ and NaOH solutions at 18°C

| $C_{NH_3}$/mol dm$^{-3}$ | $C_{Ba(OH)_2}$/mol dm$^{-3}$ | $C_{NaOH}$/mol dm$^{-3}$ | $C_{Cu}$/mol dm$^{-3}$ |
|---|---|---|---|
| 1 | 0 | 0 | 0.0109 |
| 1 | 0.0025 | 0 | 0.00907 |
| 1 | 0.005 | 0 | 0.00801 |
| 1 | 0.01 | 0 | 0.00633 |
| 1 | 0.02 | 0 | 0.00526 |
| 2 | 0 | 0 | 0.0314 |
| 2 | 0.01 | 0 | 0.0277 |
| 4 | 0 | 0 | 0.0784 |
| 4 | 0.01 | 0 | 0.0747 |
| 1 | 0 | 0.01 | 0.00766 |
| 1 | 0 | 0.02 | 0.00655 |
| 1 | 0 | 0.03 | 0.00531 |
| 1 | 0 | 0.05 | 0.00456 |
| 1 | 0 | 0.10 | 0.00410 |

**AUXILIARY INFORMATION**

**METHOD/APPARATUS/PROCEDURE:**

No information is given but apparently equilibrium was approached isothermally, The method used to determine the copper content of the saturated solutions is not mentioned or described.

**SOURCE AND PURITY OF MATERIALS:**

Crystalline $Cu(OH)_2$ was prepared by adding $NH_4OH$ to aqueous $CuSO_4$, washing the precipitate, and drying it over $H_2SO_4$ in a vacuum. The $Ba(OH)_2$ was purified by repeated crystallization. The NaOH was prepared by the action of sodium on water in a $CO_2$-free atmosphere. The $NH_4OH$ was prepared by distilling aqueous $NH_4OH$ to which NaOH had been added and collecting the $NH_3$ vapor in conductivity water.

**ESTIMATED ERROR:**

No details are given.

**REFERENCES:**

| COMPONENTS: | ORIGINAL MEASUREMENTS: |
|---|---|
| (1) Copper(II) hydroxide; $Cu(OH)_2$; [20427-59-2]<br>(2) Sodium hydroxide; NaOH; [1310-73-2]<br>(3) Ammonium hydroxide; $NH_4OH$; [1336-21-6]<br>(4) Water; $H_2O$; [7732-18-5] | Arkhipov, M. I. *Zhur. Prikład. Khim.* 1948, *21*, 235-44. |
| **VARIABLES:**<br>Concentration of $NH_4OH$ and of NaOH at 18-20°C. | **PREPARED BY:**<br>T. Michalowski |

**EXPERIMENTAL VALUES:**

Effect of NaOH on the solubility of $Cu(OH)_2$ in aqueous $NH_3$ at 18-20°C.

| $C_{NH_3}$/g dm$^{-3}$ | $C_{NaOH}$/g dm$^{-3}$ | $C_{Cu}$/g dm$^{-3}$ | $C_{Cu}$/mol dm$^{-3}$ [a] |
|---|---|---|---|
| 50 | 0 | 3.73 | 0.059 |
| 50 | 5 | 2.53 | 0.040 |
| 50 | 10 | 2.20 | 0.035 |
| 50 | 20 | 2.05 | 0.032 |
| 100 | 0 | 6.79 | 0.107 |
| 100 | 5 | 5.79 | 0.091 |
| 100 | 10 | 4.66 | 0.073 |
| 100 | 20 | 4.66 | 0.073 |
| 200 | 0 | 9.85 | 0.155 |
| 200 | 5 | 7.79 | 0.123 |
| 200 | 10 | 6.26 | 0.099 |
| 200 | 20 | 6.39 | 0.101 |

[a] Calculated by the editor.

**AUXILIARY INFORMATION**

| METHOD/APPARATUS/PROCEDURE: | SOURCE AND PURITY OF MATERIALS: |
|---|---|
| Mixtures of solid $Cu(OH)_2$ and solvent were shaken, then allowed to stand for 18 hours. After this period the mixtures were shaken again, allowed to stand to let the precipitate settle, and then filtered. An iodometric titration was used to determine the copper content of the filtrate. | The $Cu(OH)_2$ was prepared by adding an excess of NaOH to an ammoniacal solution of $CuSO_4$. The precipitate was washed with cold water and then dried over $CaCl_2$ in a desiccator. No information is given about any of the other materials. |
| | **ESTIMATED ERROR:**<br>No details are given. |
| | **REFERENCES:** |

| COMPONENTS: | ORIGINAL MEASUREMENTS: |
|---|---|
| (1) Copper(II) hydroxide; $Cu(OH)_2$; [20427-59-2]<br>(2) Acetone; $C_3H_6O$; [67-64-1]<br>(3) Ammonium hydroxide; $NH_4OH$; [1336-21-6]<br>(4) Water; $H_2O$; [7732-18-5] | Arkhipov, M. I. *Zhur. Prikład. Khim.* 1948, *21*, 235-44. |
| **VARIABLES:**<br>Concentration of acetone at 18-20°C. | **PREPARED BY:**<br>T. Michalowski |

**EXPERIMENTAL VALUES:**

Effect of acetone on the solubility of $Cu(OH)_2$ in aqueous $NH_3$ at 18-20°C.

| $C_{acetone}$/g dm$^{-3}$ | $C_{Cu}$/g dm$^{-3}$ | $C_{acetone}$/mol dm$^{-3}$ [a] | $C_{Cu}$/mol dm$^{-3}$ [a] |
|---|---|---|---|
| 0 | 9.73 | 0 | 0.153 |
| 3.9 | 9.45 | 0.067 | 0.149 |
| 7.8 | 9.32 | 0.134 | 0.147 |
| 15.6 | 8.92 | 0.269 | 0.140 |

[a] These values were calculated by the editor.

AUXILIARY INFORMATION

**METHOD/APPARATUS/PROCEDURE:**

$Cu(OH)_2$ was mixed with a solution containing the acetone and 200 g dm$^{-3}$ of $NH_3$. The mixture was shaken, allowed to stand for 18 hours, then shaken again and filtered. The filtrate was analyzed for copper content by iodometric titration.

**SOURCE AND PURITY OF MATERIALS:**

The $Cu(OH)_2$ was prepared by adding an excess of NaOH to an ammoniacal solution of $CuSO_4$. The precipitate was washed with cold water and then dried over $CaCl_2$ in a desiccator. No information is given about any of the other materials that were used.

**ESTIMATED ERROR:**

No details are given.

**REFERENCES:**

| COMPONENTS: | ORIGINAL MEASUREMENTS: |
|---|---|
| (1) Copper(II) hydroxide; $Cu(OH)_2$; [20427-59-2]<br>(2) Ammonium hydroxide; $NH_4OH$; [1336-21-6]<br>(3) Methanol; $CH_4O$; [67-56-1]<br>(4) Water; $H_2O$; [7732-18-5] | Arkhipov, M. I. *Zhur. Prikład. Khim.* 1948, *21*, 235-44. |
| **VARIABLES:**<br>Concentration of methanol at a temperature of 18-20°C. | **PREPARED BY:**<br>T. Michalowski |

**EXPERIMENTAL VALUES:**

Solubility of $Cu(OH)_2$ in aqueous $NH_3$ [a] containing $CH_3OH$ at 18-20°C.

| $C_{CH_4O}$/g dm$^{-3}$ | $C_{Cu}$/g dm$^{-3}$ | $C_{CH_4O}$/mol dm$^{-3}$ [b] | $C_{Cu}$/mol dm$^{-3}$ [b] |
|---|---|---|---|
| 0 | 9.85 | 0 | 0.155 |
| 7.9 | 8.65 | 0.247 | 0.136 |
| 39.5 | 8.65 | 1.23 | 0.136 |
| 79.0 | 8.00 | 2.47 | 0.126 |

[a] The concentration of $NH_3$ in all solutions was 200 g dm$^{-3}$.

[b] These values were calculated by the editor.

**AUXILIARY INFORMATION**

**METHOD/APPARATUS/PROCEDURE:**

Solid $Cu(OH)_2$ and an ammoniacal solution containing 200 g $NH_3$ dm$^{-3}$ and methanol were shaken, allowed to stand for 18 hours, and then shaken again. After the precipitate had settled out the mixture was filtered and the copper content of the filtrate was determined iodometrically.

**SOURCE AND PURITY OF MATERIALS:**

The $Cu(OH)_2$ was prepared by adding an excess of NaOH to an ammoniacal solution of $CuSO_4$. The precipitate was washed with cold water and dried over $CaCl_2$ in a desiccator. No information is given about any of the other materials that were used.

**ESTIMATED ERROR:**

No details are given.

**REFERENCES:**

| COMPONENTS: | ORIGINAL MEASUREMENTS: |
|---|---|
| (1) Copper(II) hydroxide; $Cu(OH)_2$; [20427-59-2]<br>(2) Ammonium hydroxide; $NH_4OH$; [1336-21-6]<br>(3) Ethanol; $C_2H_6O$; [64-17-5]<br>(4) Water; $H_2O$; [7732-18-5] | Arkhipov, M. I. *Zhur. Prikład. Khim.* 1948, *21*, 235-44. |
| **VARIABLES:**<br>Concentration of ethanol at a temperature of 18-20°C. | **PREPARED BY:**<br>T. Michalowski |

**EXPERIMENTAL VALUES:**

Solubility of $Cu(OH)_2$ in aqueous $NH_3$ solutions [a] containing $C_2H_5OH$ at 18-20°C.

| $C_{C_2H_6O}$/g dm$^{-3}$ | $C_{Cu}$/g dm$^{-3}$ | $C_{C_2H_6O}$/mol dm$^{-3}$ [b] | $C_{Cu}$/mol dm$^{-3}$ [b] |
|---|---|---|---|
| 0 | 9.85 | 0 | 0.155 |
| 7.8 | 9.00 | 0.169 | 0.142 |
| 39.0 | 8.15 | 0.846 | 0.128 |
| 62.4 | 7.27 | 1.35 | 0.114 |
| 78.0 | 7.00 | 1.69 | 0.110 |

[a] The concentration of $NH_3$ in each solution was 200 g dm$^{-3}$.

[b] These values were calculated by the editor.

**AUXILIARY INFORMATION**

| METHOD/APPARATUS/PROCEDURE: | SOURCE AND PURITY OF MATERIALS: |
|---|---|
| A mixture of solid $Cu(OH)_2$ and an ammoniacal solution containing 200 g $NH_3$ dm$^{-3}$ and the alcohol was shaken, allowed to stand for 18 hours, then shaken again. After the precipitate had settled out the mixture was filtered and the copper content of the filtrate was determined iodometrically. | The $Cu(OH)_2$ was prepared by adding an excess of NaOH to an ammoniacal solution of $CuSO_4$. The precipitate was washed with cold water and dried over $CaCl_2$ in a desiccator. No information is given about any of the other materials that were used. |
| | **ESTIMATED ERROR:**<br>No details are given. |
| | **REFERENCES:** |

| COMPONENTS: | ORIGINAL MEASUREMENTS: |
|---|---|
| (1) Copper(II) hydroxide; $Cu(OH)_2$; [20427-59-2]<br>(2) Ammonium hydroxide; $NH_4OH$; [1336-21-6]<br>(3) 1-Propanol; $C_3H_8O$; [71-23-8]<br>(4) Water; $H_2O$; [7732-18-5] | Arkhipov, M. I. *Zhur. Prikład. Khim.* 1948, *21*, 235-44. |
| **VARIABLES:**<br>Concentration of 1-propanol at a temperature of 18-20°C. | **PREPARED BY:**<br>T. Michalowski |

**EXPERIMENTAL VALUES:**

Solubility of $Cu(OH)_2$ in aqueous $NH_3$ solutions [a] containing 1-propanol at 18-20°C.

| $C_{C_3H_8O}$/g dm$^{-3}$ | $C_{Cu}$/g dm$^{-3}$ | $C_{C_3H_8O}$/mol dm$^{-3}$ [b] | $C_{Cu}$/mol dm$^{-3}$ [b] |
|---|---|---|---|
| 0 | 9.85 | 0 | 0.155 |
| 8.0 | 9.32 | 0.133 | 0.147 |
| 40.0 | 8.40 | 0.666 | 0.132 |
| 80.0 | 7.20 | 1.33 | 0.113 |

[a] The concentration of $NH_3$ in each of these solutions was 200 g dm$^{-3}$.

[b] These values were calculated by the editor.

**AUXILIARY INFORMATION**

| METHOD/APPARATUS/PROCEDURE: | SOURCE AND PURITY OF MATERIALS: |
|---|---|
| Solid $Cu(OH)_2$ and an ammoniacal solution containing 200 g $NH_3$ dm$^{-3}$ and the alcohol were mixed and shaken, then allowed to stand for 18 hours. After this standing the mixture was shaken again and filtered. The copper content of the filtrate was determined by iodometric titration. | The $Cu(OH)_2$ was prepared by adding an excess of NaOH to an ammoniacal solution of $CuSO_4$. The precipitate was washed with cold water and dried over $CaCl_2$ in a desiccator. No information is given about any of the other materials that were used. |
| | **ESTIMATED ERROR:**<br>No details are given. |
| | **REFERENCES:** |

| COMPONENTS: | ORIGINAL MEASUREMENTS: |
|---|---|
| (1) Copper(II) hydroxide; $Cu(OH)_2$; [20427-59-2] | Arkhipov, M. I. *Zhur. Prikład. Khim.* 1948, *21*, 235-44. |
| (2) Ammonium hydroxide; $NH_4OH$; [1336-21-6] | |
| (3) Glucose; $C_6H_{12}O_6$; [50-99-7] | |
| (4) Water; $H_2O$; [7732-18-5] | |
| **VARIABLES:** | **PREPARED BY:** |
| Concentration of glucose and of ammonium hydroxide. | T. Michalowski |

**EXPERIMENTAL VALUES:**

Effect of glucose on the solubility of $Cu(OH)_2$ in aqueous $NH_3$ solutions.

| $C_{NH_3}$/g dm$^{-3}$ | Period of standing, in hours | $C_{glucose}$/g dm$^{-3}$ | $C_{Cu}$/g dm$^{-3}$ | $C_{Cu}$/mol dm$^{-3}$ [a] |
|---|---|---|---|---|
| 91.0 | 3 | 0 | 8.00 | 0.126 |
| 91.0 | 3 | 10 | 16.10 | 0.253 |
| 91.0 | 24 | 0 | 8.00 | 0.126 |
| 91.0 | 24 | 10 | 13.10 | 0.206 |
| 91.0 | 72 | 0 | 8.00 | 0.126 |
| 91.0 | 72 | 10 | 12.85 | 0.202 |
| 12.0 | 24 | 0 | 11.35 | 0.179 |
| 12.0 | 24 | 10 | 16.30 | 0.257 |

[a] These values were calculated by the editor.

**AUXILIARY INFORMATION**

**METHOD/APPARATUS/PROCEDURE:**

Mixtures of solid $Cu(OH)_2$ and ammoniacal solutions were shaken, allowed to stand for some time, then shaken again and filtered. The copper content of the filtrate was determined iodometrically. The temperature is not stated, but it appears from the article that the work was done at room temperature, about 19°C.

**SOURCE AND PURITY OF MATERIALS:**

The $Cu(OH)_2$ was prepared by adding excess NaOH to an ammoniacal solution of $CuSO_4$. The precipitate was washed with cold water and dried in a desiccator. No information is given about any of the other materials that were used.

**ESTIMATED ERROR:**

No details are given.

**REFERENCES:**

| COMPONENTS: | ORIGINAL MEASUREMENTS: |
|---|---|
| (1) Copper(II) hydroxide; $Cu(OH)_2$; [20427-59-2]<br>(2) Ammonium hydroxide; $NH_4OH$; [1336-21-6]<br>(3) Sucrose; $C_{12}H_{22}O_{11}$; [57-50-1]<br>(4) Water; $H_2O$; [7732-18-5] | Arkhipov, M. I. *Zhur. Prikład. Khim.* 1948, *21*, 235-44. |
| **VARIABLES:**<br>Concentration of sucrose and of ammonium hydroxide. | **PREPARED BY:**<br>T. Michalowski |

**EXPERIMENTAL VALUES:**

Effect of sucrose on the solubility of $Cu(OH)_2$ in aqueous $NH_3$ solutions.

| $C_{NH_3}$/g dm$^{-3}$ | Period of standing, in hours. | $C_{sucrose}$/g dm$^{-3}$ | $C_{Cu}$/g dm$^{-3}$ | $C_{Cu}$/mol dm$^{-3}$ [a] |
|---|---|---|---|---|
| 91 | 3 | 0 | 8.01 | 0.126 |
| 91 | 3 | 10 | 10.30 | 0.162 |
| 137 | 3 | 0 | 7.94 | 0.125 |
| 137 | 3 | 10 | 10.20 | 0.161 |

[a] These values were calculated by the editor.

**AUXILIARY INFORMATION**

**METHOD/APPARATUS/PROCEDURE:**

Mixtures of solid $Cu(OH)_2$ and ammoniacal solution were shaken, allowed to stand for some time, then shaken again and filtered. The copper content of the filtrate was determined iodometrically. The temperature is not stated but it presumably was 18-20°C.

**SOURCE AND PURITY OF MATERIALS:**

The $Cu(OH)_2$ was prepared by adding excess NaOH to an ammoniacal solution of $CuSO_4$. The precipitate was washed with cold water and dried in a desiccator. No information is given about any of the other materials that were used.

**ESTIMATED ERROR:**

No details are given.

**REFERENCES:**

| COMPONENTS: | ORIGINAL MEASUREMENTS: |
|---|---|
| (1) Copper(II) hydroxide; $Cu(OH)_2$; [20427-59-2]<br>(2) Ammonium hydroxide; $NH_4OH$; [1336-21-6]<br>(3) Urea; $CH_4N_2O$; [57-13-6]<br>(4) Water; $H_2O$; [7732-18-5] | Arkhipov, M. I. *Zhur. Prikład. Khim.* 1948, *21*, 235-44. |
| **VARIABLES:**<br>Concentration of $NH_4OH$ and of urea at a temperature of 18-20°C. | **PREPARED BY:**<br>T. Michalowski |

**EXPERIMENTAL VALUES:**

Solubility of $Cu(OH)_2$ in aqueous $NH_3$ solutions [a] containing urea at a temperature of 18-20°C.

| $C_{urea}$/g dm$^{-3}$ | $C_{Cu}$/g dm$^{-3}$ | | $C_{Cu}$/mol dm$^{-3}$ [b] | |
|---|---|---|---|---|
| | A | B | A | B |
| 0 | 3.75 | 7.87 | 0.059 | 0.124 |
| 3.0 | 3.75 | 7.90 | 0.059 | 0.124 |

[a] The concentrations of $NH_3$ are; for columns A, 50 g dm$^{-3}$; for columns B, 100 g dm$^{-3}$.

[b] These values were calculated by the editor.

**AUXILIARY INFORMATION**

| METHOD/APPARATUS/PROCEDURE: | SOURCE AND PURITY OF MATERIALS: |
|---|---|
| 30 g dm$^{-3}$ of $Cu(OH)_2$ was added to the ammonia + urea solution. The mixture was shaken, allowed to stand for 18 hours, and then was shaken again. After sedimentation, the mixture was filtered, and the copper content of the filtrate was determined iodometrically. | An excess of NaOH was added to an ammoniacal solution of $CuSO_4$. The precipitated $Cu(OH)_2$ was washed with cold water and dried in a desiccator. No other information is given. |
| | **ESTIMATED ERROR:**<br>No indication is given. |
| | **REFERENCES:** |

| COMPONENTS: | ORIGINAL MEASUREMENTS: |
|---|---|
| (1) Copper(II) hydroxide; $Cu(OH)_2$; [20427-59-2]<br>(2) Ammonium hydroxide; $NH_4OH$; [1336-21-6]<br>(3) Ammonium carbonate; $(NH_4)_2CO_3$; [506-87-6]<br>(4) Water; $H_2O$; [7732-18-5] | Arkhipov, M. I. *Zhur. Prikład. Khim.* 1948, *21*, 235-44. |
| **VARIABLES:**<br>Concentration of $NH_4OH$ and of $(NH_4)_2CO_3$ at a temperature of 18-20°C. | **PREPARED BY:**<br>T. Michalowski |

**EXPERIMENTAL VALUES:**

Solubility of $Cu(OH)_2$ in aqueous $NH_3$ solutions containing $(NH_4)_2CO_3$ at 18-20°C.[a]

| $C_{NH_3}$/g dm$^{-3}$ | $C_{Cu}$/g dm$^{-3}$ | | | | $C_{Cu}$/mol dm$^{-3}$ [b] | | | |
|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | A | B | C | D |
| 50 | 3.86 | 8.0 | 12.80 | 20.20 | 0.061 | 0.126 | 0.201 | 0.318 |
| 100 | 7.65 | 11.25 | 13.90 | 25.30 | 0.120 | 0.177 | 0.219 | 0.398 |
| 132 | 11.65 | - - - | 22.70 | - - - | 0.183 | - - - | 0.357 | - - - |
| 182 | 9.85 | - - - | 20.40 | - - - | 0.155 | - - - | 0.321 | - - - |
| 200 | 9.65 | 12.25 | 17.44 | 24.95 | 0.152 | 0.193 | 0.274 | 0.393 |

[a] The concentrations of $(NH_4)_2CO_3$ are: columns A, none; columns B, 5 g dm$^{-3}$; columns C, 10 g dm$^{-3}$; columns D, 20 g dm$^{-3}$.

[b] These values were calculated by the editor.

**AUXILIARY INFORMATION**

| METHOD/APPARATUS/PROCEDURE: | SOURCE AND PURITY OF MATERIALS: |
|---|---|
| Mixtures of $Cu(OH)_2$ and solution were shaken, allowed to stand for 18 hours, then shaken again and filtered. The filtrate was analyzed iodometrically to determine its copper content. | The $Cu(OH)_2$ was prepared by adding an excess of NaOH to an ammoniacal solution of $CuSO_4$. The precipitate was washed with cold water and dried over $CaCl_2$ in a desiccator. No further information is given about the materials that were used. |
| | **ESTIMATED ERROR:**<br>No details are given. |
| | **REFERENCES:** |

| COMPONENTS: | ORIGINAL MEASUREMENTS: |
|---|---|
| (1) Copper(II) hydroxide; $Cu(OH)_2$; [20427-59-2]<br>(2) Ammonium hydroxide; $NH_4OH$; [1336-21-6]<br>(3) Ammonium sulfate; $(NH_4)_2SO_4$; [7783-20-2]<br>(4) Water; $H_2O$; [7732-18-5] | Arkhipov, M. I. *Zhur. Prikład. Khim.* 1948, *21*, 235-44. |
| **VARIABLES:**<br>Concentration of $NH_4OH$ and of $(NH_4)_2SO_4$ at a temperature of 18-20°C. | **PREPARED BY:**<br>T. Michalowski |

**EXPERIMENTAL VALUES:**

Solubility of $Cu(OH)_2$ in aqueous $NH_3$ solutions containing $(NH_4)_2SO_4$ at 18-20°C. [a]

| $C_{NH_3}$/g dm$^{-3}$ | $C_{Cu}$/g dm$^{-3}$ | | | | $C_{Cu}$/mol dm$^{-3}$ [b] | | | |
|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | A | B | C | D |
| 50 | 3.25 | 5.75 | 8.75 | 11.40 | 0.051 | 0.090 | 0.138 | 0.179 |
| 100 | 7.62 | 10.06 | 13.90 | 18.40 | 0.120 | 0.158 | 0.219 | 0.290 |
| 137 | 7.94 | - - - | 13.50 | - - - | 0.125 | - - - | 0.212 | - - - |
| 182 | 9.50 | - - - | 18.40 | - - - | 0.150 | - - - | 0.290 | - - - |

[a] The concentrations of $(NH_4)_2SO_4$ are: columns A, none; columns B, 5 g dm$^{-3}$; columns C, 10 g dm$^{-3}$; columns D, 20 g dm$^{-3}$.

[b] These values were calculated by the editor.

**AUXILIARY INFORMATION**

| METHOD/APPARATUS/PROCEDURE: | SOURCE AND PURITY OF MATERIALS: |
|---|---|
| Mixtures of $Cu(OH)_2$ and solution were shaken, allowed to stand for 18 hours, then shaken again and filtered. The filtrate was analyzed iodometrically to determine its copper content. | The $Cu(OH)_2$ was prepared by adding an excess of NaOH to an ammoniacal solution of $CuSO_4$. The precipitate was washed with cold water and dried over $CaCl_2$ in a desiccator. |
| | **ESTIMATED ERROR:**<br>No details are given. |
| | **REFERENCES:** |

| COMPONENTS: | ORIGINAL MEASUREMENTS: |
|---|---|
| (1) Copper(II) hydroxide; $Cu(OH)_2$; [20427-59-2]<br>(2) Ammonium hydroxide; $NH_4OH$; [1336-21-6]<br>(3) Ammonium thiocyanate; $NH_4SCN$; [1762-95-4]<br>(4) Water; $H_2O$; [7732-18-5] | Arkhipov, M. I. *Zhur. Prikład. Khim.* 1948, *21*, 235-44. |
| **VARIABLES:**<br>Concentration of $NH_4OH$ and of $NH_4SCN$ at a temperature of 18-20°C. | **PREPARED BY:**<br>T. Michalowski |

**EXPERIMENTAL VALUES:**

Solubility of $Cu(OH)_2$ in aqueous $NH_3$ solutions containing $NH_4SCN$ at 18-20°C. [a]

| $C_{NH_3}$/g dm$^{-3}$ | $C_{Cu}$/g dm$^{-3}$ | | | | $C_{Cu}$/mol dm$^{-3}$ [b] | | | |
|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | A | B | C | D |
| 50 | 3.19 | 5.65 | 7.75 | 12.15 | 0.050 | 0.089 | 0.122 | 0.191 |
| 100 | 7.44 | 9.38 | 11.50 | 16.75 | 0.117 | 0.148 | 0.181 | 0.264 |
| 132 | 11.75 | - - - | 16.15 | - - - | 0.185 | - - - | 0.254 | - - - |
| 182 | 9.85 | - - - | 16.65 | - - - | 0.155 | - - - | 0.262 | - - - |
| 200 | 9.65 | 11.05 | 13.70 | 18.10 | 0.152 | 0.174 | 0.216 | 0.285 |

[a] The concentrations of $NH_4SCN$ are: columns A, none; columns B, 5 g dm$^{-3}$; columns C, 10 g dm$^{-3}$; columns D, 20 g dm$^{-3}$.

[b] These values were calculated by the editor.

**AUXILIARY INFORMATION**

| METHOD/APPARATUS/PROCEDURE: | SOURCE AND PURITY OF MATERIALS: |
|---|---|
| Mixtures of $Cu(OH)_2$ and solution were shaken, allowed to stand for 18 hours, then shaken again and filtered. The filtrate was analyzed iodometrically to determine its copper content. | The $Cu(OH)_2$ was prepared by adding an excess of NaOH to an ammoniacal solution of $CuSO_4$. The precipitate was washed with cold water and dried over $CaCl_2$ in a dessicator. No other information about the materials is given. |
| | **ESTIMATED ERROR:**<br>No information is given. |
| | **REFERENCES:** |

| COMPONENTS: | ORIGINAL MEASUREMENTS: |
|---|---|
| (1) Copper(II) hydroxide; $Cu(OH)_2$; [20427-59-2]<br>(2) Ammonium hydroxide; $NH_4OH$; [1336-21-6]<br>(3) Pyridine; $C_5H_5N$; [110-86-1]<br>(4) Water; $H_2O$; [7732-18-5] | Arkhipov, M. I. *Zhur. Prikład. Khim.* 1948, *21*, 235-44. |
| **VARIABLES:**<br>Concentration of $NH_4OH$ and of pyridine at a temperature of 18-20°C. | **PREPARED BY:**<br>T. Michalowski |

**EXPERIMENTAL VALUES:**

Solubility of $Cu(OH)_2$ in aqueous $NH_3$ solutions [a] containing pyridine at a temperature of 18-20°C.

| $C_{pyridine}$/g dm$^{-3}$ | $C_{Cu}$/g dm$^{-3}$ | | $C_{Cu}$/mol dm$^{-3}$ [b] | |
|---|---|---|---|---|
| | A | B | A | B |
| 0 | 3.75 | 7.87 | 0.059 | 0.124 |
| 10 | 3.62 | 7.38 | 0.057 | 0.116 |
| 25 | 3.37 | 7.12 | 0.053 | 0.112 |
| 50 | 2.95 | 6.50 | 0.046 | 0.102 |

[a] The concentrations of $NH_3$ are; for columns A, 50 g dm$^{-3}$; and for columns B, 100 g dm$^{-3}$.

[b] These values were calculated by the editor.

AUXILIARY INFORMATION

| METHOD/APPARATUS/PROCEDURE: | SOURCE AND PURITY OF MATERIALS: |
|---|---|
| 30 g dm$^{-3}$ of $Cu(OH)_2$ was added to the solution of ammonium hydroxide and pyridine. The mixture was shaken, allowed to stand for 18 hours, and then shaken again. After sedimentation, the mixture was filtered, and the copper content of the filtrate was determined iodometrically. | An excess of NaOH was added to an ammoniacal solution of $CuSO_4$. The precipitated $Cu(OH)_2$ was washed with cold water and dried in a desiccator. No further information is given. |
| | **ESTIMATED ERROR:**<br>No information is given. |
| | **REFERENCES:** |

| COMPONENTS: | ORIGINAL MEASUREMENTS: |
|---|---|
| (1) Copper(II) hydroxide; $Cu(OH)_2$; [20427-59-2]<br>(2) Ammonium hydroxide; $NH_4OH$; [1336-21-6]<br>(3) Aminobenzene (*aniline*); $C_6H_7N$; [62-53-3]<br>(4) Water; $H_2O$; [7732-18-5] | Arkhipov, M. I. *Zhur. Prikład. Khim.* 1948, *21*, 235-44. |
| **VARIABLES:**<br>Concentration of aminobenzene at a temperature of 18-20°C. | **PREPARED BY:**<br>T. Michalowski |

**EXPERIMENTAL VALUES:**

Solubility of $Cu(OH)_2$ in aqueous $NH_3$ solutions [a] containing aminobenzene at a temperature of 18-20°C.

| $C_{C_6H_7N}$/g dm$^{-3}$ | $C_{Cu}$/g dm$^{-3}$ | $C_{C_6H_7N}$/mol dm$^{-3}$ [b] | $C_{Cu}$/mol dm$^{-3}$ [b] |
|---|---|---|---|
| 0 | 9.73 | 0 | 0.153 |
| 5.1 | 9.65 | 0.055 | 0.152 |
| 16.2 | 9.65 | 0.174 | 0.152 |
| 20.4 | 9.12 | 0.219 | 0.144 |

[a] The concentration of $NH_3$ in each solution was 200 g dm$^{-3}$.

[b] These values were calculated by the editor.

**AUXILIARY INFORMATION**

| METHOD/APPARATUS/PROCEDURE: | SOURCE AND PURITY OF MATERIALS: |
|---|---|
| 30 g dm$^{-3}$ of $Cu(OH)_2$ was added to the ammonium hydroxide solution containing the aminobenzene. The mixture was shaken, allowed to stand for 18 hours, and then shaken again. After sedimentation, the mixture was filtered, and the copper content of the filtrate was determined iodometrically. | An excess of NaOH was added to an ammoniacal solution of $CuSO_4$. The precipitated $Cu(OH)_2$ was washed with cold water and then dried in a desiccator. No further information is given. |
| | **ESTIMATED ERROR:**<br>No details are given. |
| | **REFERENCES:** |

| COMPONENTS: | ORIGINAL MEASUREMENTS: |
|---|---|
| (1) Copper(II) hydroxide; $Cu(OH)_2$; [20427-59-2]<br>(2) Lithium chloride; LiCl; [7447-41-8]<br>(3) Lithium hydroxide; LiOH; [1310-65-2]<br>(4) Water; $H_2O$; [7732-18-5] | Spivakovskii, V. B.; Makovskaya, G. V.<br>*Zh. Neorg. Khim.* 1968, *13*, 1555-61;<br>*Russ. J. Inorg. Chem. (Engl. transl.)* 1968, *13*, 815-9. |
| **VARIABLES:** | **PREPARED BY:** |
| Composition of the solution used to precipitate the $Cu(OH)_2$, presumably at room temperature. | T. P. Dirkse |

**EXPERIMENTAL VALUES:**

All the solubility data are presented only in the form of small graphs.

When quantities of LiOH and $CuCl_2$ solutions had been added in amounts equivalent to $Cu(OH)_2$, the copper concentration and the pH of the solution were measured. The activity coefficient of the $Cu^{2+}$ ions was calculated using the Debye-Huckel equation. Such calculations gave a vlaue of $1.3 \times 10^{-20}$ for the thermodynamic solubility product constant.

From the solubility of $Cu(OH)_2$ in alkaline solutions and the value of $K_{so}$ the authors calculate, by successive approximations, the following instability constants.

| Complex | K | Reaction |
|---|---|---|
| $CuOH^+$ | $1 \times 10^{-6}$ | $CuOH^+ = Cu^{2+} + OH^-$ |
| $Cu(OH)_2$ | $6.6 \times 10^{-8}$ | $Cu(OH)_2 = CuOH^+ + OH^-$ |
| $Cu(OH)_3^-$ | $5.3 \times 10^{-2}$ | $Cu(OH)_3^- = Cu(OH)_2 + OH^-$ |
| $Cu(OH)_4^{2-}$ | $7.2 \times 10^{-1}$ | $Cu(OH)_4^{2-} = Cu(OH)_3^- + OH^-$ |

**AUXILIARY INFORMATION**

| METHOD/APPARATUS/PROCEDURE: | SOURCE AND PURITY OF MATERIALS: |
|---|---|
| Aqueous solutions of $CuCl_2$ were treated with a solution containing LiOH and LiCl. Apparently the copper content of the solution was determined as increasing amounts of the precipitating solution were added, but the analytical method is not mentioned or described. The pH of the solution was also measured. The composition of the precipitate was determined from the amount of $Cu^{2+}$ ion that had been removed from the solution and the amount of precipitating solution that had been added. | No information is given. |
| | **ESTIMATED ERROR:**<br>No information is given. |
| | **REFERENCES:** |

| COMPONENTS: | ORIGINAL MEASUREMENTS: |
|---|---|
| (1) Copper(II) oxide; CuO; [1317-38-0]<br>(2) Sodium chloride; NaCl; [7647-14-5]<br>(3) Potassium chloride; KCl; [7447-40-7]<br>(4) Carbon dioxide; $CO_2$; [124-38-9]<br>(5) Water; $H_2O$; [7732-18-5] | Shlyapnikov, D. S.; Shtern, E. K. *Zh. Neorg. Khim.* 1977, *22*, 1100-6; *Russ. J. Inorg. Chem. (Engl. transl.)* 1977, *22*, 604-8. |
| **VARIABLES:** | **PREPARED BY:** |
| Concentration of chlorides, pressure of $CO_2$, and temperature. | T. P. Dirkse |

**EXPERIMENTAL VALUES:** Solubility of CuO in solutions of chlorides.

| Salt | $C_{salt}$/mol dm$^{-3}$ | 20°C, $pCO_2$ = 50 atm<br>$C_{Cu}$/g dm$^{-3}$ | 200°C, $pCO_2$ = 90 atm<br>$C_{Cu}$/g dm$^{-3}$ |
|---|---|---|---|
| none | 0 | 0.038 | 0.202 |
| NaCl | 1 | 0.2060 | 0.5310 |
| " | 2 | 0.2950 | 0.7400 |
| " | 3 | 0.3900 | 0.9950 |
| " | 4 | 0.4800 | 1.2000 |
| KCl | 1 | 0.2650 | 0.6500 |
| " | 2 | 0.4180 | 0.9750 |
| " | 3 | 0.6271 | 1.3400 |
| " | 4 | 0.8362 | 1.7200 |

X-ray and chemical analyses showed that at 200°C and $pCO_2$ = 100 atm, some of the CuO had been changed to $Cu_4Cl_2(OH)_6$.

AUXILIARY INFORMATION

| METHOD/APPARATUS/PROCEDURE: | SOURCE AND PURITY OF MATERIALS: |
|---|---|
| The CuO and an excess of chloride solution were placed in an autoclave and mechanically shaken for 24 hours. The mixture was then filtered through a corundum filter built into the autoclave. The copper content of the filtrate was determined by the thiosulfate method. | All materials were of reagent grade quality. The chlorides were recrystallized. |
| | **ESTIMATED ERROR:**<br>No details are given. |
| | **REFERENCES:** |