Group 6 Cations

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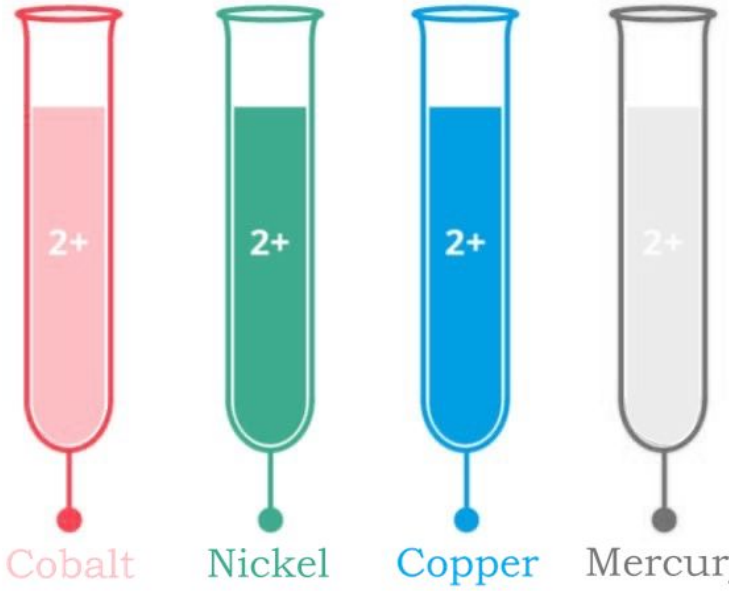
Cations

- Group 6 consists of copper 2+ **blue** cation, mercury 2+ **colourless** cation, cobalt 2+ **pink** cation and nickel 2+ **green** cation.



Common reagent

The common reagent of this group is aqueous ammonia solution NH_4OH. When ammonia solution is added, cations of this group form precipitates of various colors.

$$2CuSO_4 + 2NH_4OH = Cu_2(OH)_2SO_4\downarrow + (NH_4)_2SO_4,$$
$$CoCl_2 + NH_4OH = CoOHCl\downarrow + NH_4Cl,$$
$$NiCl_2 + NH_4OH = NiOHCl\downarrow + NH_4Cl,$$
$$HgCl_2 + 2NH_4OH = [HgNH_2]Cl\downarrow + NH_4Cl + 2H_2O.$$

- When excess ammonia solution is added, these precipitates will dissolve into colorful solutions.

$$Cu_2(OH)_2SO_4\downarrow + 6NH_4OH + (NH_4)_2SO_4 = 2[Cu(NH_3)_4]SO_4 + 8H_2O,$$
$$CoOHCl\downarrow + 5NH_4OH + NH_4Cl = [Co(NH_3)_6]Cl_2 + H_2O,$$
$$NiOHCl\downarrow + 5NH_4OH + NH_4Cl = [Ni(NH_3)_6]Cl_2 + 6H_2O,$$
$$[Hg(NH_2)]Cl\downarrow + 2NH_4OH + NH_4Cl = [Hg(NH_3)_4]Cl_2 + 2H_2O.$$

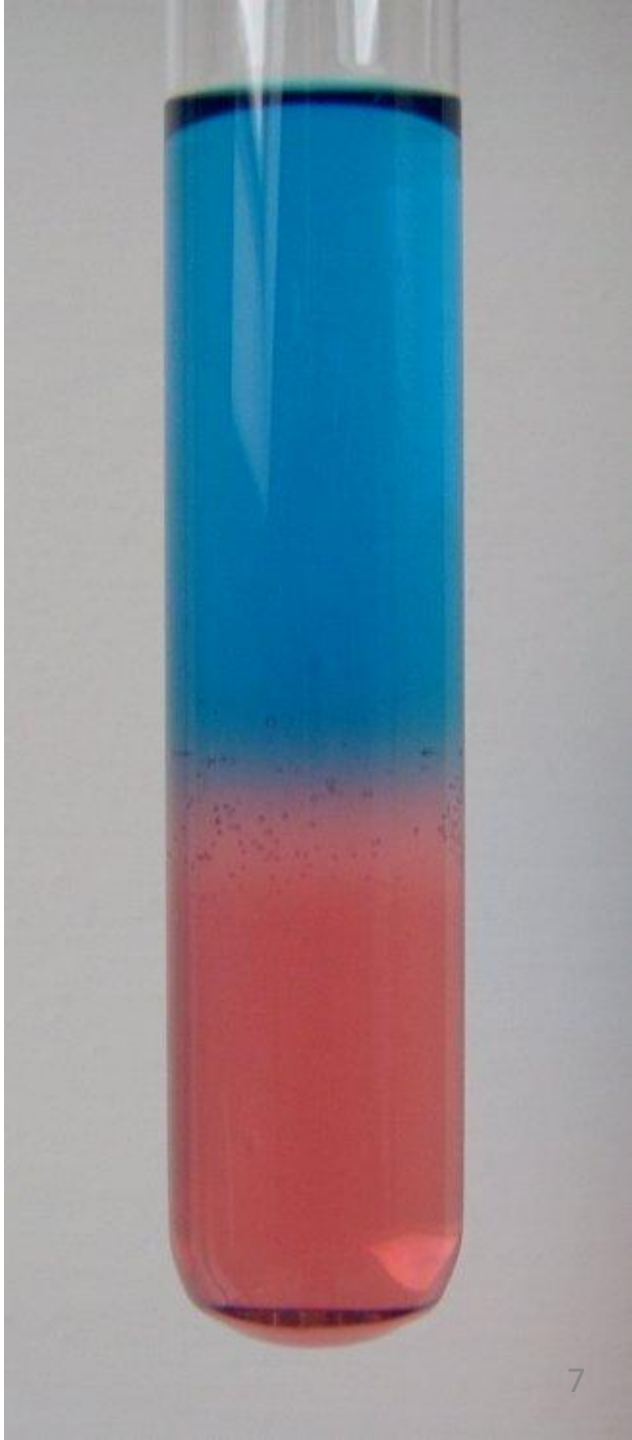
Determination

- **Copper 2+**
- We can use a flame test and see the blue-green flame.
- Also we can use the reaction with potassium ferrocyanide $K_4[Fe(CN)_6]$. This reaction yields to the formation of brown-red precipitate $Cu_2[Fe(CN)_6]$.

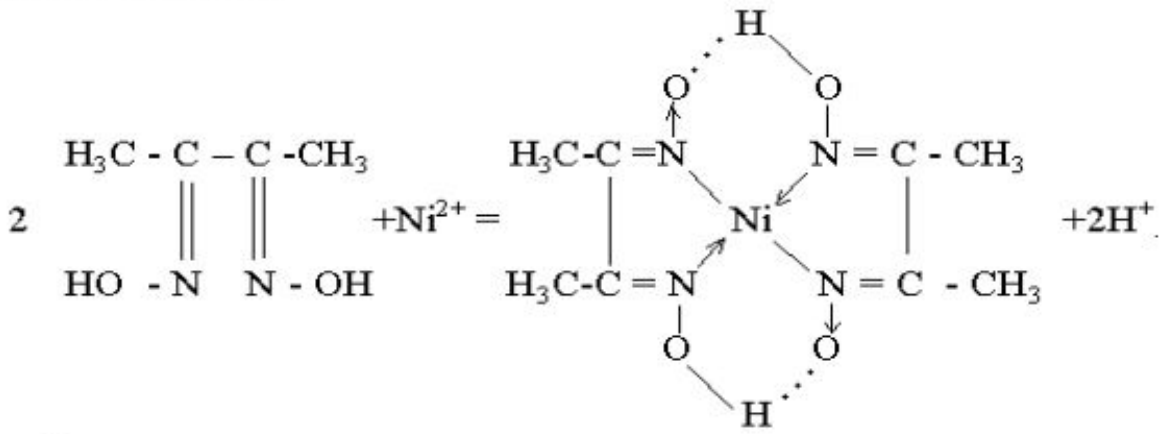
- **Mercury 2+**
- We can use the reaction with potassium iodide KI. The brown-red precipitate of mercury iodide HgI_2 is formed.

$$Hg^{2+} + KI = HgI_2\downarrow + K^+$$

- **Cobalt 2+**
- We can use the reaction ammonium thiocyanate NH_4SCN. The solution turns to blue. For this reaction we should use an organic compound for extraction.



- **Nickel 2+**
- We can use the reaction with Dimethylglyoxime. The crimson precipitate is formed.



Application

- Compounds of Group 6 cations found a use in medicine and pharmacy. For example, mercury oxide is a part of some medicinal creams, mercury chloride and copper sulfate are used in antiseptics.

Thanks for your attention!