With zirconium fluoride no results were obtained, the solutions remaining clear after standing several days.

Beyond these qualitative tests no work was done with the thorium or zirconium salts in connection with tungsten and molybdenum.

SUMMARY.

1. The tungstates and molybdates are precipitated quantitatively by nearly all the rare earths.

2. A separation of tungstic and molybdic acids is not possible through their combinations with the rare earths.

3. The non-precipitation of molybdic acid by uranyl solutions when tungstates are absent, and the almost complete precipitation of both when tungstic acid is also present is further evidence of the fact that we can scarcely hope to effect this separation by the method of precipitation.

4. The molybdates and tungstates of neodymium and praseodymium are new, and their constitution is correctly represented by the formula $Nd_2(MoO_4)_3$, $Nd_2(WO_4)_3$, and $Pr_2(MoO_4)_3$, $Pr_2(WO_4)_3$.

5. The solubility determinations indicate that tungstates and molybdates of the rare earths must be classed among the more difficultly soluble compounds.

6. Further research is required upon the methods to be followed in the separation of tungstic and molybdic acids from the oxides of the rare earths.

A NEW TABLE FOR THE QUALITATIVE SEPARATION OF THE METALS OF THE IRON GROUP.

By C. L. HARE.

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IN the qualitative separation of metals of the iron group much trouble has been experienced with the methods in general use for the separation of cobalt and nickel.

The methods commonly used for the separation of iron, aluminum, and chromium are also unsatisfactory.

The following compilation and application of methods recently worked up greatly simplifies and shortens the process for the qualitative separation of the metals of this group.

In the separation of chromium from iron and aluminum advantage is taken of the well-known action of hydrogen peroxide on chromium compounds in presence of an alkali, the insoluble chromium compound being oxidized to soluble chromic acid. (Bauman *Ztschr. anal. chem.*, *1892* and others.)

The separation of nickel and cobalt, after the removal of manganese and zinc by hydrochloric acid, depends upon the solubility of nickel sulphide in a solution of sodium sulphide, the cobalt sulphide being insoluble in this reagent. (Villiers, *compt. rend.*, **119,** 1263, and **120**, 46.) The sulphides of the two metals are dissolved in aqua regia and the greater part of the acid expelled. The solution is diluted and a slight excess of tartaric acid is added to prevent precipitation of the two metals by sodium hydroxide, which is next added in great excess. Hydrogen sulphide is now passed through the hot solution till no further precipitation occurs. Cobalt sulphide is precipitated and the nickel sulphide is held in solution by the sodium sulphide. The presence of a trace of nickel is indicated by the deep brown or black color which it imparts to the solution. The nickel sulphide is precipitated from this solution by the addition of dilute hydrochloric acid.

The following is an outline of the treatment: To a solution of the metals of the iron group add ammonium chloride and ammonium hydroxide, warm, and filter. Boil the precipitated iron, aluminum, and chromium hydroxides with sodium hydroxide, filter, acidify the filtrate, and add ammonium hydroxide. A white precipitate indicates aluminum. Boil the residue of iron and chromium hydroxides with sodium hydroxide and a few cubic centimers of hydrogen peroxide. Filter; a yellow solution indicates chromium. Acidify filtrate with acetic acid and add lead acetate. A yellow precipitate indicates chromium. Dissolve residue of iron hydroxide in hydrochloric acid and add potassium ferrocyanide. A blue precipitate indicates iron.

To the filtrate from iron, aluminum and chromium hydroxides add freshly prepared ammonium sulphide, heat, and filter. Wash the precipitate with cold dilute hydrochloric acid to dissolve manganese and zinc and treat the washings as usual for these two metals. Dissolve the residue of nickel and cobalt sulphides, left after washing with hydrochloric acid, in aqua regia, expel nearly all the acid, dilute, and add slight excess of tartaric acid, and then very great excess of sodium hydroxide. Boil and pass hydrogen sulphide through till no further precipitation occurs, filter immediately. Test the precipitate for cobalt by borax bead. The presence of nickel in the filtrate is indicated by its deep brown or black color. If nickel be absent the filtrate will be yellow or colorless.

If nickel be present add dilute hydrochloric acid to filtrate filter, and test the precipitate for nickel by borax bead.

The ammonium sulphide should be prepared as recently as possible, as an excess of sulphur in solution causes the solution of a portion of the nickel sulphide.

THE PROTEIDS OF BARLEY.[1]

BY THOMAS B. OSBORNE.

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THE proteids of barley have received little attention on the part of chemists. Mulder[2] states that this grain contains six per cent. of albumin and plant-gelatin; the latter was obtained by extracting barley-meal with hot alcohol, cooling the resulting solution and treating the deposited substance with ether. The composition of this body he gave as follows:

	1	2
Carbon	54.93	54.75
Hydrogen	7.11	6.99
Nitrogen	15.71	15.71
Sulphur	0.57	0.62
Oxygen	21.68	21.93
	100.00	100.00

v. Bibra[3] names albumin, plant-gelatin, and casein as constituents of barley but gives no particulars concerning these bodies further than that they all contain on the average 15.5 to 15.6 per cent. of nitrogen.

Kreusler made an investigation of the proteids of barley, the

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[1] From the Report of the Connecticut Agricultural Experiment Station for 1894.

[2] Phys. Chem., I, 306–308.

[3] Die Getreidearten u. das Brod. Nürnberg, *1860*, p. 304.