

Ammonium molybdate test for phosphate

Introduction

We have had several calls about this test failing and we confirmed that a method for Intermediate I Chemistry using 0.5 cm³ of 1M nitric acid did not give the expected yellow precipitate of ammonium phosphomolybdate. Traditional methods certainly worked, but used higher concentrations of nitric acid, which would have had to be dispensed by the teacher or technician.

After several trials we came back to a method, which does work, using a slightly larger volume of 1M nitric acid. This method also has the benefit of working at room temperature in 15-30 seconds!

We found it worked best using boiling tubes. Ensure these are new or cleaned and rinsed with distilled water. Also all solutions, including the dilute nitric acid, should be freshly prepared using distilled water.

These precautions are to avoid possible contamination from detergents etc.

Preparation of the phosphate sample solution

Dissolve 0.38g of Na₃PO₄ in a little distilled water and make the volume up to 20 cm³ with more distilled water to give a 0.05M solution.

Preparation of ammonium molybdate reagent solution

1. Dissolve 4 g of ammonium molybdate in 4 cm³ 0.880 ammonia (Corrosive & Dangerous for the Environment) and 6 cm³ of distilled water.

2. Add about 50 to 60 cm³ of distilled water, dissolve 12 g ammonium nitrate (Corrosive, Irritant & Oxidising) in it and dilute to 100 cm³ with distilled water.

Testing for phosphate ions

1. Place a 1 cm³ of the sample solution in a boiling tube. A control can also be done simultaneously by replacing the phosphate solution with 1 cm³ of distilled water.

2. Add 2 cm³ of ammonium molybdate solution and then 4 cm³ of 1M nitric acid (Corrosive) and shake gently to mix.

3. Continue shaking the tube gently.

4. Formation of a yellow precipitate indicates the presence of phosphate ions.

Safety

Substance	Hazard	Control measures
0.880 Ammonia	Corrosive, Dangerous for the Environment: Toxic if inhaled in high concentrations or if swallowed. Forms explosive mixtures in air (16-25%). Gas and solutions very irritating to the eyes. Solution burns skin and swallowing causes internal damage.	Preparation of solution Wear gloves and goggles and prepare in fume cupboard or in very well ventilated room. Do not grind ammonium nitrate or evaporate solution to dryness. Avoid raising dusts from ammonium nitrate and ammonium molybdate; this is easy because of the crystalline nature of these two salts. Wash up well any spillages of ammonium nitrate as it can ignite dust or paper. Use of solution Wear indirect vent goggles and rinse any splashes off the skin immediately.
Ammonium Nitrate	Corrosive, Irritant: A powerful Oxidising agent. Dust is irritating to eyes	
1M Nitric Acid	Corrosive: The dilute acid burns the eyes, digestive system & the skin.	
Ammonium molybdate	Harmful by ingestion and inhalation.	

Table 1 - Substance, hazards and control measures required for preparation of solution

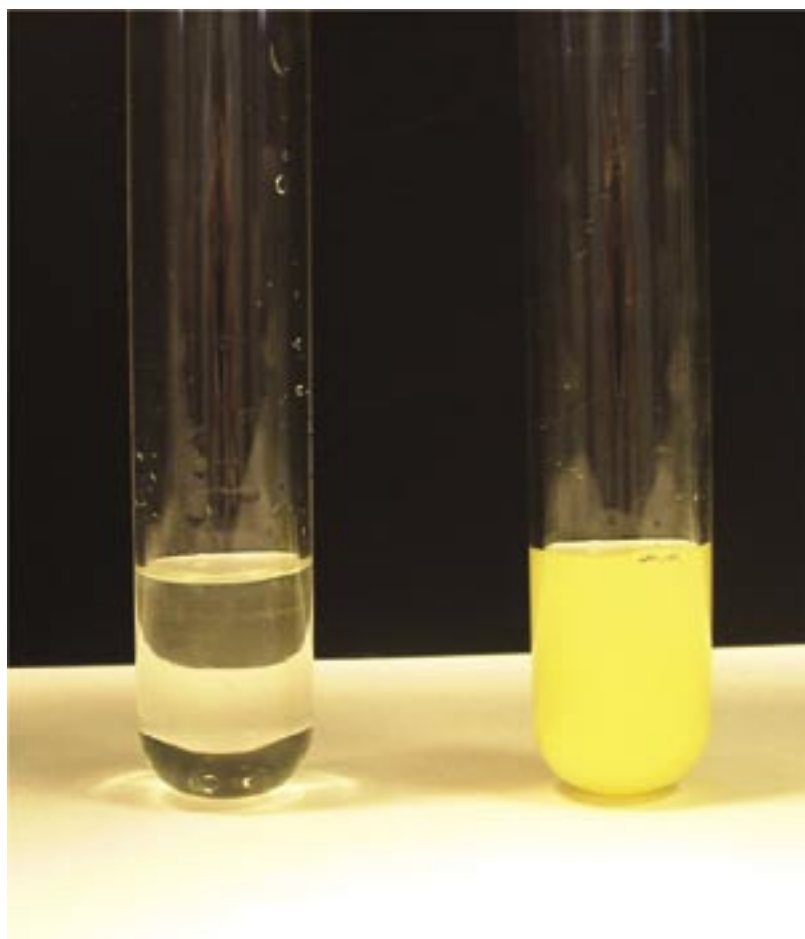


Figure 1 - Control solution and solution containing phosphate ions after testing