

Demonstration corner

The Silver Mirror

Just to show that chemistry is not all about whooshes and bangs, here is a quiet, gentle and beautiful demonstration that is really quite easy to do.

N.B. Do NOT make up the solution more than an hour in advance and dispose immediately after use. On standing, ammoniacal silver nitrate can form a touch sensitive explosive.

You will need:

- A round-bottomed flask - the bigger the better (once the demonstration has been completed you can remove the silver and re-use it).
- 1 x 100 cm³ beaker.
- Stirring rod (or magnetic stirrer);
- Concentrated (16 mol dm⁻³) nitric acid [**corrosive**] (from a dropping bottle*).
- 0.10 mol dm⁻³ silver nitrate.
- Concentrated (15 mol dm⁻³ [0.88]) aqueous ammonia solution [**corrosive**] (from a dropping bottle*).
- 0.80 mol dm⁻³ sodium hydroxide [**corrosive**].
- 0.5 mol dm⁻³ glucose solution.
- Hot water.

* You can use a Pasteur pipette rather than a dropping bottle.

Preparing the flask

(Wear goggles [BS EN 166 3])
Place about 3 cm³ of concentrated nitric acid (16 mol dm⁻³) into the flask and stopper it. Swirl the acid around to dampen the entire interior surface of the flask; this will clean off any residues on the inside. Pour the acid from the flask, and flush it down the drain with water. Rinse the flask with cold water and stopper it.

No more than ten minutes before presenting the demonstration, fill the flask with hot water to warm it (hot tap water is fine).

Preparing the mixture

(Wear goggles [BS EN 166 3])
Pour 30 cm³ of 0.10 mol dm⁻³ AgNO₃ into the 100 cm³ beaker.

While stirring the solution, add drops of 15 mol dm⁻³ ammonia [**corrosive**] until the brown precipitate which forms initially has just dissolved.

Add 15 cm³ of 0.80 mol dm⁻³ sodium hydroxide [**corrosive**] to this mixture. A precipitate forms; to this precipitate add drops of 15 mol dm⁻³ ammonia until the precipitate dissolves once more.

Presentation

Empty the hot water from the flask.

Pour 10 cm³ of 0.5 mol dm⁻³ glucose into the flask.

Add the contents of the beaker, and stopper the flask. Swirl the flask continuously to cover its entire

surface with a thin coating of the liquid.

Within about a minute, the flask will begin to darken as a film of metallic silver forms on its inside surface.

Continue to swirl the flask until the entire interior of the flask is covered with a film of silver, and the flask looks like a mirror.

After the demonstration, do NOT save the silver solution in a silver residues container. The solution must be disposed of down the sink with plenty of cold water within 30 minutes of mixing at the start of the demonstration. This is to avoid any chance of the formation of a deposit of silver fulminate, a dangerously explosive substance.

As long as you have rinsed the flask out, with cold water, it is perfectly safe and you can keep it for as long as you want. To clean the flask, wash it with dilute nitric acid. Some of the silver will dissolve but most will just loosen and you can reclaim it by filtering to recycle. ◀

