

# DEMONSTRATION 8.9

## EXPLOSIVE DECOMPOSITION OF NITROGEN TRIIODIDE

Iodine powder is dissolved in aqueous ammonia and the resultant solution is then allowed to dry on three filter papers. These are touched with a feather on a long pole, giving rise to the violent explosion of nitrogen triiodide and emission of violet smoke.

### CAUTION



**When dry, nitrogen triiodide ( $\text{NI}_3$ ) is extremely unstable and can detonate unexpectedly. A slight touch or even an air movement can trigger the explosion.**

In contrast, wet nitrogen triiodide is relatively safe to handle.

### EQUIPMENT

- 50 mL beaker
- stirring rod and spatula
- filter paper, at least 9 cm diameter
- feather or a shred of tissue paper
- pole, about 2 metres long
- headphones
- adhesive tape
- optional: retort stand with 3 retort rings, perspex safety screen

### REAGENTS



- iodine,  $\text{I}_2$  (3 g)
- ammonia,  $\text{NH}_3$  (15 M, 15 mL)

### PREPARATION

- Use the beaker to make up nitrogen triiodide.
- Add iodine to the ammonia.
- Stir and let stand for 15 minutes.

### CAUTION



**Concentrated ammonia solution can cause burns. It is irritating to the eyes, skin and respiratory system.**

- Place three pieces of filter paper on the bench, at least half a metre apart or place them on the retort rings which are mounted on the retort stand, one above the other, with as much vertical distance between them as possible.
- Secure filter paper with adhesive tape to the desk or retort rings.
- Place the safety screen in position.
- Fasten the feather or the tissue securely to the top of the pole with adhesive tape.

### CAUTION



**The following preparation must be completed within 5 minutes!**

- Retaining the solid matter in the beaker, decant the supernatant liquor into a sink and flush with water.
- With a spatula, scrape the brown residue of nitrogen triiodide onto a stack of four pieces of filter paper. These will absorb most of the remaining liquid.
- Divide the solid into 3 equal parts while still damp.
- Transfer each part to one of the pieces of filter paper secured to bench or retort stand and pat down gently.
- Allow the solid to dry undisturbed for 60 minutes. In humid conditions allow a longer drying time.

**CAUTION**

**Nitrogen triiodide is extremely sensitive to the touch.**

**It is a powerful explosive!**

**Larger amounts than specified here should not be prepared!**

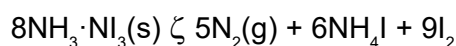
**Great care must be taken even when handling these modest amounts.**

**The noise from the explosion can cause ringing in the ears. The demonstrator must wear earplugs. Students should be warned to cover their ears with their hands and be no closer than 5 metres.**

Standing well back and using the pole, lightly touch the triiodide with the feather. If the retort ring assembly is used, only the sample on the bottom need be touched. The other two will be set off by the explosion below.

**RESULTS**

Detonation with emission of violet smoke should occur immediately. A successful detonation will completely destroy all traces of the dry nitrogen triiodide.

**DISPOSAL**

If a sample should not have exploded, rub it gently with the pole to encourage detonation or allow it more time to dry. Otherwise, carefully pour water on the lecture table so that it slowly flows into the sample. When totally wet, the sample should be flushed down the drain with water. Any nitrogen triiodide that remains in the preparation beaker or on the spatula should be decomposed by rinsing with ethanol. Let stand overnight and then flush the solution down the drain with water.