# The microscale synthesis of azo dyes – teacher notes

Topic

Organic chemistry – azo dyes.

## Timing

20 min.

Description

In this experiment students prepare an azo dye and use it to dye a piece of cotton. The synthesis is unusual in that whereas most organic syntheses require ambient or elevated temperature, this synthesis requires low temperatures.

Apparatus

* Beakers,10 cm3, x3
* Thermometer
* Tweezers

Chemicals

* Ice
* Aminobenzene (aniline)
* Hydrochloric acid (concentrated)
* Sodium nitrite
* 2-Naphthol (also called β-Naphthol; naphthalene-2-ol)
* Sodium hydroxide solution 2 mol dm-3
* Ethanol
* Urea

## Observations

The orange-red azo dye forms in the fibres of the cotton, dyeing the cloth. The melting point of 1-phenylazo-2-naphthol is 133 °C.

## Note

The urea decomposes excess HNO2 formed and prevents many side reactions from occurring. A better ‘red’ dye is usually produced.

## Reference

S. W. Breuer, Microscale practical organic chemistry. Lancaster: Lancaster University, 1991.

## Health, safety and technical notes

* Students must wear suitable eye protection (splash resistant goggles to BS EN166 3).
* This experiment should be done in a fume cupboard.
* Aminobenzene (aniline) is TOXIC by all routes, a carcinogen and mutagen, a skin sensitiser, causes eye damage and is toxic to aquatic life.
* Hydrochloric acid, HCl (aq), is CORROSIVE and a respiratory irritant.
* Sodium Nitrite, NaNO2 is an OXIDISER, toxic if swallowed and hazardous to aquatic life.
* 2-Naphthol is HARMFUL if swallowed or in contact with skin and toxic to aquatic life.
* Sodium hydroxide solution, 2 mol dm–3 NaOH (aq), is CORROSIVE.
* Ethanol is highly FLAMMABLE.
* Urea is of low hazard.