On the bleach

Some years ago, we published details of an experiment [1] to determine the rate and order of a reaction simply using the decolourising of blue food dye by household bleach. Since then, there have been various changes in formulations of food colourings by manufacturers so we thought it worthwhile revisiting what is a useful experiment.

All you need for this experiment is a colorimeter, household thin bleach, and blue food colouring – along with the usual accessories such as cuvettes, pipettes etc.

Colorimeter

Any model will work. One which allows automated readings, by connection to a datalogger for instance, is ideal but not essential. It is desirable to use a wavelength as close to 630 nm as possible but if you cannot get this exact wavelength, don't worry. The value of the rate constant will be a little out, as the molar absorption coefficient is given at 630 nm, but it will be close and the process is still valid.

Bleach

Since the article was first published, the concentration of sodium hypochlorite in thin bleaches has decreased from around 5% to 1%.

Some experimentation may be needed to ensure the reactions takes a suitable length of time.

Contains E133

- Dr. Oetker Extra Strong Blue Food Colouring Gel
- Aldi The Pantry Blue Food Colouring
- Morrisons Cake Decor Blue Colour Gel
- Wilton Royal Blue Food Colouring - Cake Craft Shop
- Lakeland PME 100% Blue Food Colouring
- Hobbycraft Rainbow Dust ProGel Food Colouring*

Contains Spirulina

- Tesco Blue Food Colouring 60 ml
- ASDA Blue Natural Food Colouring
- Morrisons Blue Food Colouring

* This has the red E122 as well so there may be issues.

Food colouring

This experiment uses Brilliant Blue FCF (E133). While this dye is considered safe, there has been a significant move away from traditional colourants towards 'natural' colours. Fortunately, for the chemist, blue is a particularly difficult colour to source 'naturally'.

Some products use spirulina (an extract from cyanobacteria) and there have been experiments with anthocyanins but it has been tricky to get these to give the right colour in a food-related context. Spirulina, for instance can give a good colour but this is not stable on cooking.

This blue will probably be decolourised by bleach but we have not been able to find the molar absorption coefficient so it is unsuitable for this particular activity.

The table above lists some of the common blue food colours – as you can see, the gel forms are all suitable (at time of publication).

Details of the method can be found on the SSERC website [2].

Dilution

We have found at SSERC that a suitable solution is 15 drops of the gel food colour in 100 cm^3 of distilled water. <<

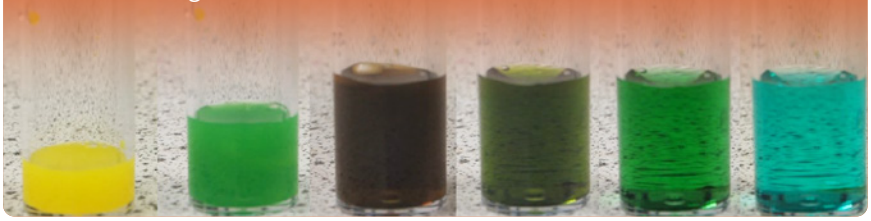
Other related experiments

Other food dyes can be decolourised by bleach too and this can give some interesting results.

For instance, different colours will often be bleached at different rates so if you mix two different dyes (yellow and blue to give green for instance) then adding bleach will cause the yellow of bleach first so the mixture will start off green and go blue before it fades.

Interestingly, most yellow food dyes use cucurmin (from turmeric) and this goes dark red on addition of bleach before it fades due to the alkaline pH of bleach solution.

Below a sequence of photos of this experiment. The bleach has been added at the third image from the left.



References

[1] Bulletin 225, Determining the rate constant and the order of a reaction.

[2] Bleaching blue food dye.