Avogadro's Lab

Turning water into wine

Stephen Ashworth shows you how to do the impossible with some clever solution chemistry



You may have heard of the story where Jesus turns water into wine at a wedding party. You can amaze your friends with some clever chemistry, which suggests you have similar skills. There are several ways to do this that all use chemical reactions to change the colour of solutions.

The trick - turn 'vodka' into 'juice' and 'wine'

This starts off with a colourless solution in an old vodka bottle. The 'vodka' is poured into a glass or beaker and some appropriate comments made before it is turned into a pink 'juice' by pouring it into a second glass. The 'juice' is made into white 'wine' by tipping it into a third glass and then 'red wine' by pouring that solution into a fourth.

The chemistry

The first two steps are acid-base chemistry. The vodka bottle contains a dilute solution of table salt with an indicator that is colourless in neutral or acidic solutions. The second glass contains a few drops of a concentrated solution of sodium carbonate; this makes the solution basic and the indicator, phenolphthalein, turns pink.

To turn the pink 'juice' into white 'wine' we acidify the solution again to remove the pink colour. A concentrated solution of iron(III) chloride will do this and turn your solution a pale yellow colour, similar to white wine.

To make the red 'wine', the glass is prepared with a few drops of a solution that can react with the iron (from the white 'wine'). Either potassium or ammonium thiocyanate can be used. In the yellow solutions the iron ion is strongly associated with water molecules. The thiocyanate ions displace the water and this new compound makes the iron appear an intense red colour, similar to the colour iron gives blood.

Kitchen version

Here in Avogadro's Lab I have devised some similar reactions that can be done with household materials.

Turmeric contains a compound called curcumin,

which is bright red in basic solutions but turns yellow again in a neutral or acidic solution. Using this I have managed to turn red (or rosé) 'wine' into white 'wine' using some washing soda and vinegar.

Recipe

You will need:

- half a teaspoon of washing soda (sodium carbonate)
- half a teaspoon of turmeric
- 🕨 a mug
- an eye dropper or teaspoon
- warm water
- 2 glasses
- a few drops of distilled vinegar

Add the washing soda to a mug of warm water. Once the crystals have dissolved, add the turmeric and mix it well. This should produce a deep red colour.

The turmeric powder does not dissolve, so put it aside for a few minutes to settle out of the mixture. Once it has settled, take an eye dropper (or a spoon) and transfer some of the deep red solution to a wine glass that has some water in it.

Add enough of the red solution to make the water look like a pale red wine. Put a few drops of distilled vinegar into a second wine glass. Now pour your red 'wine' into the glass with the vinegar the red solution will turn yellow, just like white 'wine'!



Did you know?

Phenolphthalein's name comes from the two molecules that react to make it: phenol and phthalic anhydride



Safety

- Although these experiments use materials you can find around the house, you should always take care when carrying out any experimental procedure.
- Never put solutions in incorrectly labelled bottles and especially not drinks bottles.
- Turmeric stains very badly and will even leave traces on plastic and kitchen work surfaces.
- Do not drink any of these solutions. At the very least they would not taste good and at worst they could do severe damage.