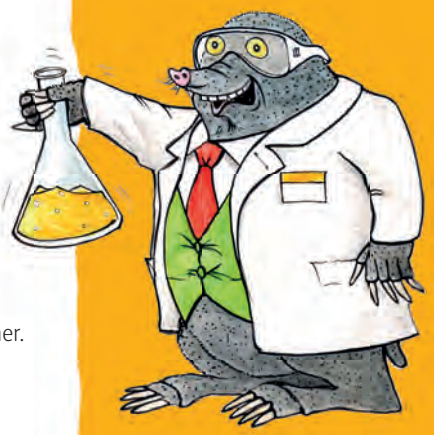
Avogadro's Lab

In this issue: The chemistry of colloids



Paul Hogg *whips up some edible colloids*

What are colloids?

Milk, mayonnaise, paint, ointments, dust, blood, fog and handcreams. We come across colloids every day, but what are they? Basically, a colloid is made up of two or more components that form a stable mixture – one component acts as a continuous medium in which the other one is dispersed. This mixture also has different properties from its individual components.

An emulsion is a special type of colloid made up from a mixture of two liquids which form a stable substance that has different physical properties to the two individual liquids.

Well known emulsions are milk and mayonnaise. Milk is a mixture of water and milk fat and mayonnaise is a mixture of oil and water, which is stabilised further by proteins in the egg yolk. When separated, the two liquids are often immiscible from one another.

A colloid is therefore a stable mixture that is made up from two or more components. These components can be a mixture of gas-liquid, liquid-liquid, solid-liquid or solid-gas. The table shows a few examples of these combinations

Try this out

Let's look at a gas-liquid colloid (foam) and a liquid-liquid colloid (emulsion). Both of these colloids are found in our everyday lives and will be very familiar to you.

1. Gas-liquid colloid (a foam)

- You will need a whisk and some double cream.
- Take the whisk and whip the cream until it is very thick. This is an example of a gas-liquid colloid, where gas is trapped within a liquid to form a stable mixture.

2. Liquid-liquid colloid (an emulsion)

- You will need two egg yolks (separated from the white), a small amount of olive oil and a whisk.
- Using the whisk, mix the two components together. Keep adding drops of olive oil until you get an emulsion that looks similar to mayonnaise.

Changing appearances

In these two simple experiments, did you notice how the physical properties and appearance of the mixtures changed when the two components were mixed together?

A good way to scientifically measure the difference in physical properties would be to take a ruler and incline it at an angle of 45 degrees. Then take each of the individual components and the colloids you have just made and measure the time it takes for a drop of each liquid to travel down the ruler by 10 cm. This will give you an indication of the viscosity of the liquid.

You probably found that the individual components were quite runny and slid down the ruler quickly, while the colloids you made from them where quite thick and stayed as blobs or slid down slowly – the colloids are more viscous than their components.

And finally...

In this experiment we have looked at some very common colloids that can be found and made in our kitchens at home. Colloids play a significant role in our lives but they are often overlooked or taken for granted. See how many more you can find; you will be surprised.

		Dispersive medium		
		Gas	**Liquid**	**Solid**
Continuous medium	**Gas**	None	Liquid aerosol *eg fog*	Solid aerosol *eg smoke*
	Liquid	Foam *eg whipped cream*	Emulsion *eg mayonnaise, milk*	Sol *eg paint, blood*
	Solid	Solid foam *eg Styrofoam*	Gel *eg jelly, cheese*	Solid sol *eg pearl, ruby*

Fascinating Fact

The word colloid was created by Thomas Graham, who also gave us Graham's gas law (**http://bit.ly/GraLaw**) and who is also the person who gives his name to the Royal Society of Chemistry offices in Cambridge, UK.

Did you know?

The word colloid comes from the greek 'Kolla', meaning glue and 'oid', meaning form. Together they mean 'glue-like'.