MATERIALS IN THE KITCHEN

Today's kitchens are full of utensils and equipment.
Although the qualities required of each are obviously different,
if you can't stand the heat get out of the kitchen...

Spatulas

Before the advent of non stick frying pans **steel** was the preferred material for spatulas, but it is too hard (strong) for delicate teflon finishes.
Wood is also used for spatulas, but it is not possible to make it as thin as with steel so they are not as versatile. There can also be hygiene problems because wood can split and food can become trapped. Nowadays polymers such as **polypropylene** (PP) and **nylon** are often used, but as the strength - maximum service temperature chart shows they must not be left standing in the pan or they will be ruined!

Ovenware

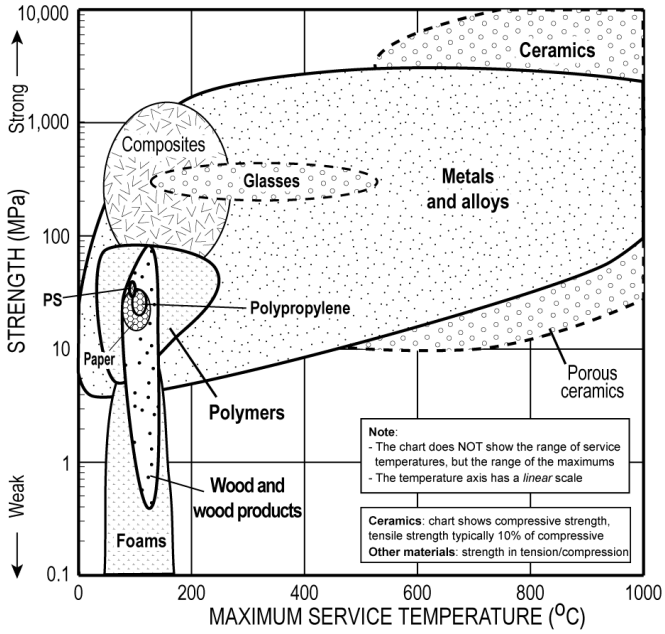
Where a utensil is going to be in contact with heat for a long time, e.g. in the oven, the choice of materials is limited. The temperature chart below shows only metals (e.g. **stainless steel**, **cast iron**, **aluminium**), **glass** and ceramics (such as **pottery**) will be suitable.

Disposable cups

Disposable cups are often made from **polystyrene** (PS). This is surprising since the chart below shows the maximum use temperature is just below 100°C, but does explain why they go out of shape in boiling water! The single skin PS cups can get too hot to hold, but **expanded polystyrene foam** (EPS) cups don't have this problem as they are better thermal insulators. Unfortunately, many people don't like the 'feel' of EPS in the mouth. Recently, double skinned PS cups have been introduced which have an insulating airpocket between the layers – this solves both the problems, but they are more expensive to make.

Plastics, plastics, everywhere plastics

Plastics have revolutionised the kitchen. Thermoplastics such as ABS, PS and PP have replaced aluminium, zinc, pottery and glass for electrical appliances such as food mixers. They offer better hygiene and easier maintenance. Polycarbonate (PC) and PMMA (perspex) have replaced glass as the transparent materials of choice except where high temperatures are experienced. Melamine thermoset work surfaces provide attractive, hard-wearing, work surfaces which are resistant to heat and water. Polyethylene has replaced wood for the handles of many implements, while thermosets are used where the temperature might get hotter.



Good enough for long enough - just!

Many materials are used at or slightly above their maximum service temperature e.g. polystyrene for coffee cups and polypropylene for spatulas. They are used because they are cheap – and provided they are not used too hot for too long, they'll be good enough for long enough.

Try it yourself 1

Design a test to see how long polymers can be held above their maximum service temperature. A good example would be to experiment with various types of polystyrene cup.

Try it yourself

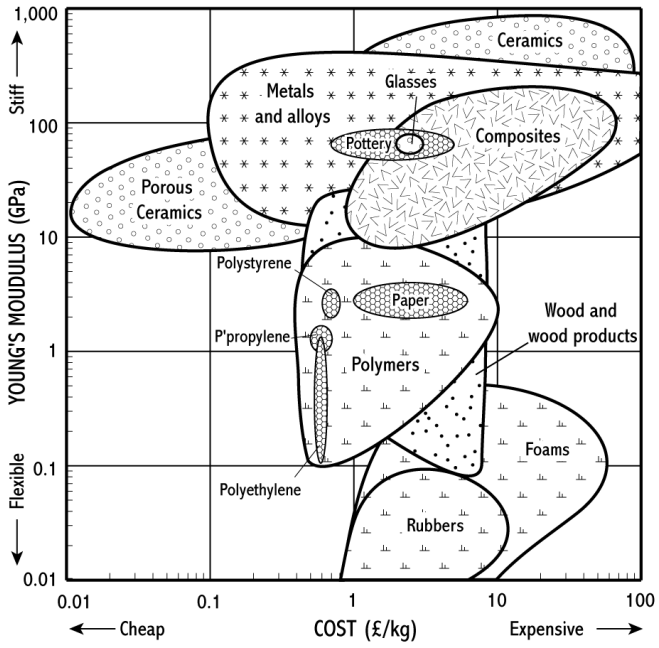
Plates

Everyone thinks of plates as being made from **pottery** (a porous ceramic). However, there are also other materials used: picnic plates are often made from **polyethylene** (PE) or **melamine** because they don't break so easily; disposable plates are usually made from **paper** (because it is cheap) – although this is often coated with a thin layer of polymer to prevent it going 'soggy' too quickly or the pattern smudging.

Try it yourself 2

Find out how long various designs of paper plate remain usable when they get damp. How does this change if they come into contact with different fluids such as vinegar or ketchup? Are more expensive paper plates really worth the money?

Try it yourself



Stiffness from shape

Most utensils need to be stiff, but the material that is used is only part of the story. Using clever shaping techniques, such as including stiffening ribs (easy with polymers), can add extra stiffness while using only slightly more material. Good examples of this are paper plates and polystyrene cups – both use corrugated edges.

Question 1

'Tupperware' provides a good seal for storing food. How does this work and what other methods are used to provide good seals?

Question

Try it yourself 3

Polymer moulding processes often leave 'evidence' behind them such as marks from ejection pin, die-lines or imperfections where feeder systems have been cut-off. Try to find these marks on kitchen utensils to guess what manufacturing processes have been used.

Try it yourself

Are plastic things actually cheap?

Polymers are relatively cheap, but the chart above shows that some metals are cheaper. But does that mean polymer products are more expensive? No! Although metals can be cheaper *per kg*, they are a lot more dense and we generally can't make metal things very thin. As a result, the weight of a polymer utensil can be a lot less than the weight of a metal utensil – so overall the polymer product actually costs less!

In addition to the lower material costs, polymers are also cheaper to manufacture. This is because there is usually only one manufacturing step, whereas with metals there may be many (e.g. casting, machining, grinding, joining etc.).

Question 2

Utensils made from metals, or more than one material, often need to be joined in some way. What methods are used in common kitchen utensils and what are their advantages/drawbacks?

Question