## GCSE Design & Technology

Developments in new materials: **smart materials**

Museum of Design in Plastics

Smart materials react to their environment. They change their properties in response to a stimulus such as light, moisture, stress or temperature. They often return to their original state when the stimulus is removed. Here are some examples from MoDiP's collections.

Developed by British engineer Richard Palmer in 1999, D3O is an innovative material with intelligent molecules that protect against injury. The putty-like substance has free-flowing molecules which lock on impact, absorbing and dispersing energy before instantly returning to their flexible state. Here, D3O is used to provide impact protection at the hip in the Race Face cycling shorts. It has been moulded to shape and is held in place in strategically located pockets so that it can be removed prior to washing.


The colour-changing baby safety spoon from LCR Hallcrest, is made from injection moulded polypropylene blended with thermochromic microcapsules. Heat sensitive, the spoon changes from blue to pink as a warning that the food is too hot. It reverses back to the original blue colour as the spoon cools below the activation temperature point.


Another example of a thermochromic object is the Smart Lid developed by Noshmell Pty Ltd., Australia. Made from polystyrene with thermochromic additives, the colour-changing lid acts as an indicator to the consumer that the contents are hot and that the lid is fitted safely. When the liquid contents of the cup are cold, the lid remains brown. When it is fitted to a cup of hot liquid it rapidly changes to a red (for danger), reverting to brown as the contents cool. An ill-fitting lid is indicated by inconsistencies in the colour, helping to eliminate the possibility of spillage and scalding.


The set of sample spoons made by LCR Hallcrest are composed of Chameleon®, a photochromic material which is activated by ultra violet light. The material activates after only a 15 second exposure, reversing back to the original colour after 5 minutes once the stimulus is removed. The different colours fade at different rates with the samples here changing from white to purple, white to red, and pale green to dark blue. Also included in this group is a sample of glow-in-the-dark material, which appears white when in the light.