

Liquid crystals are largely printed by the silk screen method to achieve a suitable coating thickness for good colour and because the encapsulated material is not small enough to effectively print by other printing methods. Liquid crystals react quickly to changes in temperature, as they warm up the helical structure expands, lengthens and their colour changes. This process is reversible and specific colours can be offered. They can be formulated to change at very specific temperature trigger points, making them highly suitable for temperature monitoring purposes, especially where traditional glass thermometers are not suitable.

The typically seen items of liquid crystal will be the thermometer strip stuck onto an aquarium monitoring the water temperature or a thermometer strip on a printed card indicating the room temperature. Liquid crystal temperature indicators are used on the forehead during surgical operations to monitor body temperature during anaesthesia, and can be found in millions of fridges in Europe indicating whether the internal air temperature is low enough to discourage bacteria growth. Liquid crystals are also found in jewellery (i.e. mood rings) and have even been incorporated into wall cladding for children's play areas and nightclubs.



Chill Indicators

Thermochromic pigments are also microencapsulated, but rather than being helical structures, they change colour with variations in temperature due to small chemical changes. As they change more slowly than liquid crystals they are not suitable as thermometers but they are good as indicators of temperature or trend. These pigments do not need a black background and can change from one colour to another or from a colour to clear. They are widely used in the promotional field as collectible colour changing cards and stickers for children, as win/lose game cards in promotions, to create chill indicators on drinks labels or as touch and reveal printed communications. Their use in smart packaging is increasing to help with brand security, security printing and anti-counterfeiting measures. Thermochromic inks can be printed using screen, flexo, gravure or litho methods, however the thinner the deposit the paler the colour change effect will be.

Useful websites include:-

www.colourchange.com
www.thermochromicinks.com
www.thermochromicplastics.com
www.liquid-crystal.com
www.cookitsticks.com

These pigments can also be incorporated into plastic moulded or extruded items (i.e. spoons, straws, cups and even kettles) that change colour with heat or cold. The inks can be printed onto metal, glass and other materials - a typical application is the ceramic coffee mug that reveals a picture when filled with hot water. The pigments can also be made into textile inks for printing colour change effects onto clothing such as T-shirts, furniture and trainers.

Irreversible pigments are available in a series of self adhesive labels and a range of inks and are usually used for monitoring temperatures in industrial fields. These can indicate when a temperature has become too hot to be safe or has reached a required temperature for a reaction to occur, such as sterilization within dishwashers or food heating to kill bacteria.

One of the limitations of all thermochromics is that they are affected by prolonged UV exposure which gradually breaks down their ability to change colour, although various UV stabilizers and over-laminations are under investigation.

Applications have been extremely varied from using temperature indication for specific purposes like freezer monitoring, baby care and bath water indicators to using colour change to add an eye-catching element to products or packaging like direct mail, car paint, toiletries, furniture and even skis.

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