

Thermochromic Products

Description

These special effect pigments allow for a visual response to changes in temperature. The pigments are composed of microcapsules that change color reversibly. When the temperature is raised to a specified temperature the pigment goes from colored to colorless. The pigment returns to the original color as it cools down. The particle size of the thermochromic pigment for all products is <6 microns (97%). The color and temperature are selected by the user.

Product Properties

Colors

Standard Colors: **Red**, **Black**, and **Magenta**

Non Standard Colors: **Green**, **Brown**, **Turquoise**, **Purple**, **Blue**, **Orange**, and **Yellow**

Color matching available upon request.

Activation Temperature

Activation temperatures between -10°C and 69°C are available. The activation temperature is defined as the point the thermochromic pigment reaches 95% of its colorless state. Standard activation temperatures are 15°C, 31°C, and 47°C.

Available Products

Thermochromic powder – compatible with solvent based flexographic, UV, screen, offset, gravure and epoxy ink formulations.

Thermochromic aqueous slurry – a 48% (w/w) concentration compatible with water based flexographic, UV, screen, offset, gravure and epoxy ink formulations.

Thermochromic LDPE pellets – a 50% (w/w) concentrate compatible with polyolefins, PS, PVC, ABS, and most other resin systems.

Thermochromic aqueous screen ink (w/ binder) – a 24% (w/w) concentration compatible with paper, plastics and other substrates.

Thermochromic aqueous flexographic ink (w/ binder) – a 24% (w/w) concentration compatible with paper, plastics and other substrates.

Opacity

The opacity of the thermochromic pigment is directly related to the color, concentration and print thickness. Their color intensity is about 10 to 20 percent of a typical color pigment. Dark colors such as black can be used to hide an image whereas lighter colors such as yellow can not. Achieving this concealing effect requires concentrations of 24% or greater and multiple print passes.

Application Suggestions

Solvent Compatibility

The thermochromic pigments are sensitive to most polar solvents. Below is a list of compatible and non-compatible solvents.

Compatible Solvents

Glycols	Water	Xylene	Mineral Spirits
Isobutanol	Ethanol	Methyl Pyrrolidone	High Chain Acetates
White Spirits	High Chain Ketones	High Chain Alcohols	Butanone Oxime
Toluene	Naptha	Silicones	

Non-Compatible Solvents

Acetone	PMA	Propyl Acetate	Ammonia
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Recommended Concentrations for Ink, Paint and Plastic Formulations

	Ink/Paint (Solvent)	Ink/Paint (Aqueous)	Plastic Injection/Extrusion
Thermochromic	Powder	Aqueous Slurry	Powder / LDPE Pellets
Concentration	15%-30%	15%-30%	3.0%-5.0%

Dispersing/Mixing

The thermochromic pigments are compatible with standard mixing procedures. Be careful not to grind or damage the pigment through aggressive dispersion techniques (e.g. Bead Mills). This will destroy the structure of the microcapsules and color changing properties.

Initially mix the thermochromic pigment with a low viscosity material. Once this is thoroughly mixed, slowly add any higher viscosity material and continue to mix.

If you are having trouble with the dispersion, it is suggested to moisten the thermochromic powder into a cream form. This can be done by adding a small amount of solvent to the full quantity of thermochromic pigments to be used. Once the solvent is added, gently fold the mixture in order to form a cream. Add this mixture to a lower viscosity base and continue mixing.

The ink base should have good transparency properties. If the resulting ink layer exhibits a bumpy look additional mixing maybe required, or it is suggested to apply a clear overcoat over the printed thermochromic layer.

Printing Recommendations

General Considerations

Thermochromic inks must be printed and dried in a clean environment. Always be sure that the screens, squeegees, knives, spatulas, or any other equipment that comes into contact with the thermochromic inks are clean and dry, completely free of all solvents or other matter. In addition, the sensitivity of the thermochromic inks to UV light and high temperatures and specific chemicals should always be considered.

Aqueous Flexographic Ink

The recommended anilox is 200, and less than 150 where high color intensity is required. A hard sticky back should be used; rubber plates with soft durometer and very little nip pressure should be applied. A doctor blade is recommended over a metering roller. If your doctor blade is metallic, the anilox used should be ceramic.

Aqueous Screen Ink

The thermochromic aqueous screen inks are press ready inks formulated to work on hand or automatic (rotary or flat-bed), sheet or web-fed screen printing equipment. A US 80-150 mesh polyester monofilament screen or lower is recommended. It is preferable to use a medium or medium-hard (65 durometer) rounded edge squeegee. When drying the ink do not exceed 70°C.

Stability

Heat

Extended exposure to temperatures of >50°C can lead to degradation of the pigment. The thermochromic pigments can survive temperatures >200°C, however, if exposure is limited to <10 seconds.

Light Stability

Long exposure to UV and some fluorescent lights can degrade color intensity. Extreme exposure of more than several days of direct sunlight may degrade the color of the thermochromic pigment, though it will probably still change color. More than 600 hours of a strong fluorescent light may also cause a loss of color. Addition of an UV inhibitor can increase the lifetime of the product. The light fastness for the thermochromic pigments is 1-2 on the blue wool scale.

Storage and Handling

Store at ambient temperatures (20-25°C) out of direct sunlight and preferably in the dark. Storage longer than 12 months is not recommended for the powders and 2 months for the inks and slurries.

All applications using the thermochromic products should be thoroughly tested prior to approval for production.

The information herein is believed to be reliable and is to assist customers in determining whether our products are suitable for their applications. However, no warranty, express or implied, is made as to its accuracy or completeness and none is made as to fitness of this material for any purpose. Our products are intended for sale to industrial and commercial customers. We request that customers inspect and test our products before use and satisfy themselves as to contents and suitability. Nothing herein shall constitute any other warranty, express or implied, including any warranty of merchantability or fitness, nor of protection from any law or patent to be inferred. All patent rights are reserved. The exclusive remedy for all proven claims is replacement of our materials and in no event shall we be liable for special, incidental, or consequential damages. We shall not be liable for damages to person or property resulting from its use. Consult the Material Safety Data Sheet for additional information.